

The Iron Age

A Review of the Hardware and Metal Trades.

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Rail Mill Engine of the Joliet Iron and Steel Company.

This engine, shown in the accompanying illustration, was built by the Corliss Steam Engine Co., of Providence. It was designed especially for this work, and though differing in many respects from the well known Corliss pattern, embodies all those features which have made the reputation of these engines. The size of the engine is 40 inches diameter of cylinder by 5 feet stroke. The framing, which seems very light, is so arranged by a combination of cast iron and wrought iron braces as to give all the strength and stiffness that is needed. The frame is especially worth notice, as it is so disposed as to allow free access to the machinery. The valve gear is upon the side of the cylinder opposite the one shown in the cut. It is easily accessible from the second and third platforms. The principle upon which the economy of this style of engine depends is that of making the governor regulate the point at which the cut-off shall take place. When an increased load is thrown upon the engine the distance which the steam follows the piston is increased, and while the horse-power developed may be largely in excess of that of the previous stroke, the number of revolutions per minute will not vary perceptibly. The refinements of construction by which this result was made possible may be stated in a few words—short steam passages, small clearances, large steam ports and quickly moved valves, whose motions are perfectly under control of the governor. These points are some of the more important ones which have given this well known valve gear its world-wide reputation. In addition to this, the perfection of the workmanship and the conscientious attention to every detail has helped to give the engines a high reputation among those who have used them.

Iron and Steel by the Knowles Process.

Sir Francis Knowles has sent a letter to the editor of the *Journal of the Society of Arts*, in which he says: "It will be interesting to your readers to learn that the re-agents used in my process of refining and converting cast iron (caustic soda and oxide of iron) have been recently again tried in the common puddling furnace with complete success. I subjoin the particulars of the trials and their results. As the heat generated by the complete combustion of pyrogen gas is a matter of certainty, the only point remaining to be settled is that of economy and cost, which I believe will not long remain in doubt."

The report is signed R. H. U. A., and says: "The pig iron was carefully picked out of an uniform quality and borings taken from several pigs. Three heats of the iron were worked in No. 3 furnace (new forge), and three heats in No. 4 furnace. Both furnaces were in exactly the same condition. No. 3 worked in the ordinary way, and No. 4 had the soda worked in after the first rabble. A trial bar was taken from each heat of each furnace, and borings taken from them for analysis. The pig iron contained—silicon, 2.49; sulphur, a trace; phosphorus, 1.30. The puddled bar from No. 3 furnace (no soda) contained silicon, 0.172; sulphur, a trace; phosphorus, 0.350. The puddled bar from No. 4 (soda) contained silicon, 0.226; sulphur, a trace; phosphorus, 0.044. So that the metal, chemically treated, gave iron quite free enough of phosphorus to work in the Siemens-Martin process."

In an appended note, Sir Francis says: "A pyrogen heated furnace of proper construction may be applied readily to the production of steel directly from the ore, with a scoria so pure as to be suitable to glass making."

In a further communication respecting the "Production of Steel from the Ore," Sir Francis says: "It occurs to me that you may wish to know in what manner I propose to practically effect the fusion of such steel in large quantities so as to evade the cost of melting once or oftener in pots. I shall suppose for this purpose that we have obtained our metallic sponge from ore generally free from phosphorus, and calcined, if need be, to effect sulphur. The reduction to this state may be effected by charcoal, but I much prefer, when it can be had, reduction by a current of light or heavy carburized hydrogen gas, as this reduction takes place at a much lower temperature and is very complete. (Properly managed, the gas given off in this reduction ought, after passing through cold water, to be pure carbonic oxide). This sponge is then to be ground up with the proper flux and compressed into small cakes. A basis of richly carburized pure pig iron in fusion having been run out into the converter, the current of burning pyrogen gas, as described by me in former papers, is to be let on for a few minutes, after which the prepared ore is to be gradually added to the bath, the gas current being continued, until the exact degree of cementation of the metal required in the aggregate is attained. The weight of sponge be-

ing known, and the degree of its carburization, if any, as well as that of the original metal bath, the proper proportions are easily attained. If the flux have been well adjusted, the cinder or scoria ought to be a perfect glass, free from metallic oxide (save where manganiferous materials are present), and suitable for glass making. The heat evolved by the complete combustion of pyrogen is sufficient for the fusion of the prepared ore in a proper furnace without metal; but I hesitate to advise it, because, as it seems to me, it would render more difficult the due degree of cementation, and might corrode the lining of the furnace. In all cases the finery, furnace or converter must be gradually heated up to the point at which the bath is to be run in, as sudden contractions by heat may injure

finding at a depth of 270 feet, not alone water, but with the water a continuous stream of gas. The work was being done in connection with an hotel, and the landlord seems to have been a man of ready invention. The statement is that by way of experiment he "partially sank a hog-head with one end out over the bore and made all tight. This done, a hole was cut into the top of the hog-head, into which a pipe was inserted and carried along for many yards into the hotel. Here a burner was screwed on to the pipe, the tap was turned on, when a flame was applied and the gas ignited, and burned with a steady light, as pure and as bright as manufactured gas. It continued to burn day and night, unless when turned off, when the gas accumulated in the hog-head. Whether

seven lives had been lost by an explosion of gas at the Aldwick Collieries, and advocated the use of charts at all collieries using safety lamps, the charts to be made up every four hours. You will no doubt remember I enclosed you copy of one which was in use and had been used in one of our large Yorkshire collieries since 1873, and filled up just in the way I then described. Since that time I have seen the same chart in use at the Oaks Collieries, which pleased me very much. I find on reading your valuable paper that Mr. W. F. Cooper is impressing the same thing upon the minds of all colliery managers. All colliery managers should be thankful to Mr. Cooper for the repeated warnings he has given through your columns and for the able letter in your paper.

where safety lamps are used powder should be not—a shot is a naked light—the country begins to think we should have coal at £5 per ton by doing so. The loss to the country is enormous when we have 150 men and boys killed in one day. Something must be done to stop it; and it can be done in no other way than by following the advice given by Mr. Cooper, and by keeping powder and safety lamps, the most bitter of enemies, apart; keeping the goaves ventilated, good "Goodie" lamps securely locked, and the discipline as strict as in the army. I only hope that something more will be done by our legislators in improving the Coal Mines Act, to keep out powder; and a clause added to compel diagrams to be used, and kept upon all our pit banks, with records every four hours. Then, and only then, will the barometer be regarded as a "danger signal," and the lives of our fellow men saved from such deaths as they met with at the Swaithe Main Colliery. As I have already said, the lives of our fellow men can be saved, and they must be from such deaths. I would say more upon this great subject, but will refrain from doing so until the verdict be given at the Barnsley Court House on the Swaithe Main explosion.

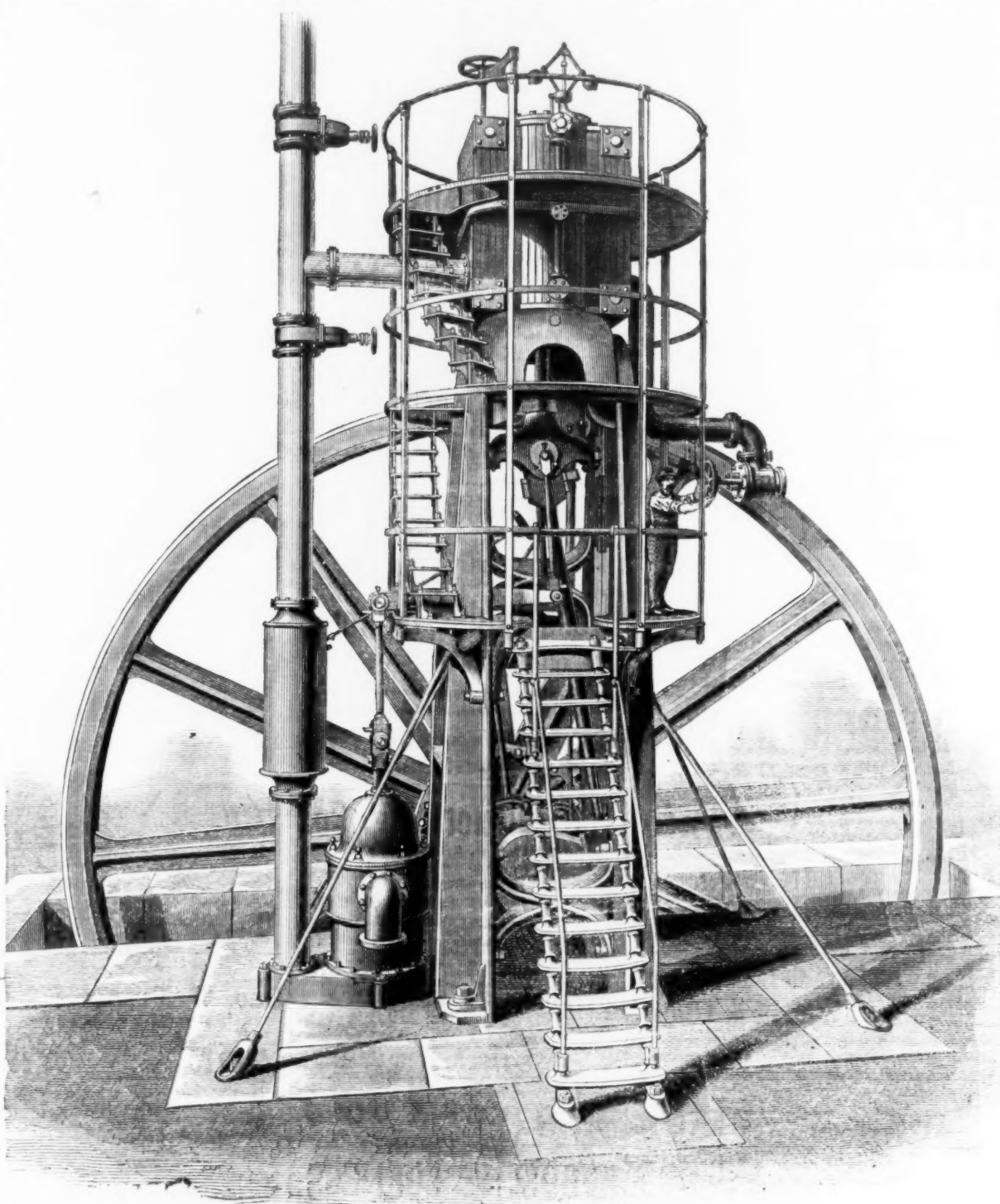
Steam Street Cars.

The Brooklyn *Engle* states that a new steam street passenger car was run on the Atlantic Avenue Railroad, from Flatbush avenue to East New York and back three times on Christmas Day, and four times on Monday. This car, which is an experimental one, so far as the railroad company is concerned, was built at the Baltimore Locomotive Works, in Philadelphia, and is the same size as an ordinary horse-car. Its front platform is occupied by an upright boiler, encased in walnut and oak wainscoting, with coal boxes on either side and ample room for the engineer, who has no more shelter than the driver of the conventional horse-car, so that his vision is unobstructed by window frames or glass, and he has constantly a full view of the roadway ahead and on both sides. The boiler furnishes steam for a direct acting engine of five nominal horse-power, but capable of being worked up to twenty-five horse-power.

The working machinery is all situated under the car, between the wheels, so that while it balances the vehicle by bringing the center of gravity to a point nearly midway between the front and rear platforms, it is almost entirely hidden from view. It is especially designed so that it may be easily attached to the horse-cars now in use, but which it is contemplated will ultimately be converted into steam cars on this route. The steam, after passing through the cylinders, enters a large exhaust pipe, which passes entirely around and under the floor of the car, thus serving to heat the interior, and when condensed, it is drawn off in the form of water by means of a faucet under the rear platform. The car is supplied with patent steam brakes of great power which are capable of stopping the vehicle in half its length when it is going at full speed, the weight of the car, which is six tons, materially assisting the brakes to prompt and effective action. The engine consumes its own smoke at all times, and also its steam, except in extremely cold weather, when the steam condenses so rapidly that a small quantity escapes. It consumes about one-quarter of a ton of anthracite coal in six round trips, and is propelled by the engine without puffing, and with no more noise than is made by the horse cars now in common use. The interior of the vehicle is handsomely frescoed and paneled with French walnut, and is separated from the front platform by a permanent partition covered with large heavy plate glass mirrors. There are comfortable seats upholstered with crimson plush, for ten passengers on either side, and there is standing room for twenty-five or thirty persons, so that the car can carry about fifty passengers when full.

The experimental trips have shown that the car can easily attain a speed of about eighteen miles per hour on a level grade, and be stopped with safety in half its own length.

A happy idea, and one worthy of general adoption, is the Iowa plan of Public School Industrial Expositions. By a State law these expositions are legalized, and a fund set apart for their support. One of these exhibitions is now open at Des Moines, containing over a thousand articles, the handwork of boys and girls from five to eighteen years of age, consisting of every imaginable design, showing the skill and genius of the children. There are painting, drawing, crochet, knitting, sewing, embroidery, wood work and cooking of every kind. Very many of the articles are said to be of an order of merit far beyond the years of the makers. The articles are grouped according to the ages of pupils, and prizes awarded. Similar exhibitions in other States would doubtless, as in Iowa, prove among the most interesting features of the school year.—*Pittsburgh Commercial*.



RAIL MILL ENGINE OF THE JOLIET IRON AND STEEL COMPANY.

the lining. The ores which I prefer are the best magnetic or spathose, well calcined, and the same may be generally said as to the metal of the bath; but a splendid basis may be obtained in metal produced from pure brown hematite, such as the ores of the Duc d'Arenberg, which have a happy content in oxide of manganese.

"In the above I contemplate the production of a high class workable steel, such, for example, as would require in the old method of cementation, Russian or other charcoal bars at £30 per ton and upward. If to this we add the cost of cementation and melting in pots, we get a pretty good margin for the above operations, raw materials included. This steel may be used also for casting articles in molds, as proposed in my letter above. Axes so made could be worn down to the 'eye' itself, to the joy of the backwoodsman."—*Iron*.

Natural Gas.—Are those persons who are looking for cheap and pure fuel for the reducing of metals in particular quite satisfied that well gas is to be found only in the United States? We note that at Gisborne, New Zealand, the sinking of an artesian well led to the

the supply will continue or exhaust itself, or whether it can be permanently utilized, or whether it will lead to discovery of coal, kerosene or some bituminous or inflammable material, will probably be the subject of search. May the search prove successful. Meanwhile it is upon record that the landlord of a public house in the neighborhood of Birmingham once lighted his house with gas which he obtained from an excavation near at hand. We know that such gas has been utilized in pits; and it is further known that in South Wales it has been known to rise to the surface of a stream and burn there upon the application of a light.—*The Engineer*.

Colliery Explosions and Atmospheric Conditions.

A "practical miner" sends a letter to the *Sheffield Telegraph*, containing suggestions which may be found to be valuable: In January last you did me the honor to publish me a letter under the head of "The barometer as a danger signal to miners," which was afterward copied by some of the papers in West Yorkshire. That letter was written after

I have looked carefully to the barometer for the last nine years, and have found it to be the same to the miners as it is to our seamen—nothing more nor less than a "danger signal." The continual loss of life by explosions in coal mines is really fearful, and until charts or diagrams be placed side by side with the barometer and thermometer upon the banks of all collieries worked with safety lamps, and where gas is found, and carefully recorded every four hours, and looked up to by managers, underviewers, deputies, and the colliers themselves as a danger signal, they will still occur. As you remark in one of your leaders, what mockery it seems to work a pit with safety lamps and bring the coal down by blasting powder. I never heard of such a thing in all my life, nevertheless, it is true. "No candles are permitted in this 'goaf' full of light carburized hydrogen," but you may use powder in the banks. This is the way the thing goes, until at last you fill one side of your paper with some fearful explosion. People begin to talk then, and we hear some say, "It is a shame to have colliers killed off like rabbits," but if we write you and say that coal can be got without powder, and

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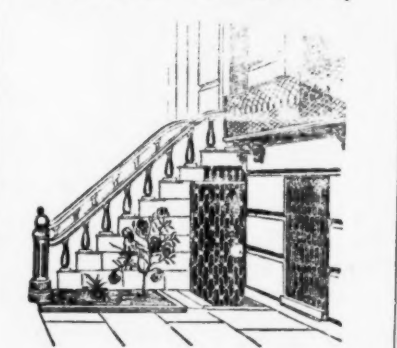
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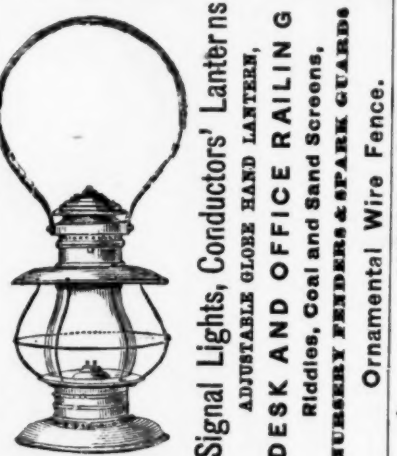
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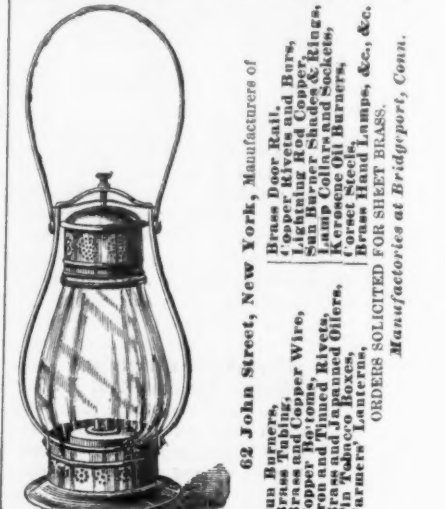
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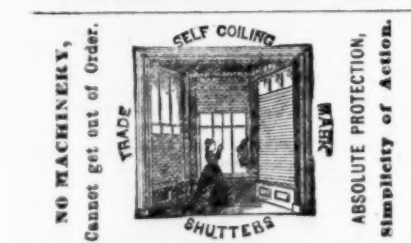
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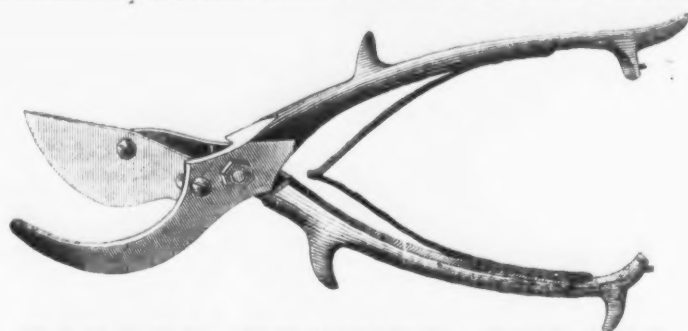
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TRENTON VISE AND TOOL WORKS.

TRENTON, N. J., Manufacturers of

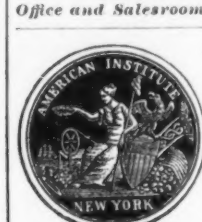
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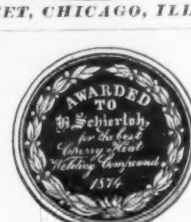
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We herewith illustrate the only really good TIN TEA KETTLE now made. We furnish only the trimmings for them; and show cuts of the Handle and Spout. The former article is much stronger than any handle which has ever been introduced. It fits the kettle splendidly, and being hollow, NEVER HEATS. The ear is strong and has a wide base. Altogether it is a fine thing, and sells at sight.
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The spout, it will be noticed, is stamped from one piece of tin, and side flanges folded ready to lock into the body of the kettle; it is then double-seamed to the bottom, as the rest of the body is. It never leaks, as do all other spouts, and cannot clog with lime. We have sold immense quantities of them, and the sale grows constantly.
Re-tinned, per doz., - 5 in. (No. 50.) 67 cts.; 6 in. (No. 60.) 75 cts.; 6 1/2 in. (No. 70.) 80 cts.
All are 2 1/2 in. wide.
If you make all of your Tea Kettles with the CHICAGO TRIMMINGS, you will materially increase your trade.

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We particularly invite the attention of large buyers to our Patent Picture Nails and Knobs being a specialty with us, we offer satisfactory discounts on good orders.

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Speaking Tube, Elbows and Mouthpieces

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The Best yet Invented.
CHEAP AND DURABLE.
Is Pleasant to the Horse, and does not injure the Brush.

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The Utica Steam Engine Company.

The works of the Utica Steam Engine Company are situated in Utica, on 86 Fayette street. It is the only establishment of the kind in that city. The works are very large and well supplied with appliances for turning out a great variety of work. The business of the company is limited, however, to steam engines, boilers and saw mills. We here point out some of the characteristics of the engines manufactured by the company, and sketch the works in which they are produced.

Among the specialties of the company's manufacture is a portable steam engine. The boiler of this engine has a large fire box entirely surrounded with water. The boilers are built of heavy iron, braced and stayed; the piston is three ring and spring; the piston rod is made of cast steel, the connecting rod of wrought iron. The main crank shaft is double, forged from scrap iron, cross piled and hammered. The bearings are very long, and each furnished with a separate box. The boiler is supplied with a large number of hand holes to increase the facility of cleaning it. The water bottom which surrounds the fire grate and ash pit, it is claimed, has several advantages; it furnishes additional heating surface and prevents accumulation of sediment; it also prevents the escape of sparks and ashes, and saves repairs. The company claim that by this boiler steam can be raised very rapidly. The engine is centrally placed upon the boiler and by this arrangement, and by placing the pulley and fly-wheel on opposite sides of the cylinder, it is claimed that all oscillation or transverse strain is avoided. The governor exercises complete control over the engine. The guides for the cross-heads and the journals are independent in their construction, and so separated as to prevent their being heated by the boiler. A heater is employed to utilize the exhaust steam, consisting of a large cast iron pipe, in which the water is heated by the exhaust steam, which afterward passes up through the smoke pipe, creating a draft and getting out the sparks. It is placed on the side of the boiler and entirely separate from the bed plate. A key seat is cut on both sides of the shaft, so that by turning an eccentric reverse motion is secured. Every boiler is tested under hydrostatic pressure up to 150 pounds per square inch. Among the other advantages claimed for this engine may be mentioned beauty of design, simplicity, and durability. An agricultural engine is manufactured here, constructed in the same manner in all its parts as the portable, and is mounted on wheels, with cast iron hubs and ribs with wrought axles and a double set of wrought iron spokes. The smoke pipe is furnished with a hinge joint, to lay it back over the engine.

The stationary engine, manufactured by this company, is also peculiar in many respects. The main bed is cast in one piece. The cylinder and steam chest are made in one casting. A direct connection between the valve rods and eccentrics with only one joint is permitted, and the steam chest is made the full length of the cylinder to place the steam ports as near the ends as possible. The main valve is an ordinary double slide valve operated by an eccentric. On the back of the main valve, at either end, is a cut-off valve. On the cut-off valve rod is turned a right and a left-hand screw, so that by turning a hand wheel at the back of the steam chest the valves may be drawn closer together to allow the steam to follow at full stroke, or may be separated so as to completely close the port and nearly stop the engine. The connecting rod is of wrought iron forged from scrap. The crank shaft is of wrought iron, with long and large journals running in anti-friction metal bearings. The piston rod is screwed to the cross-head and secured by a jam nut at its end. This allows the piston rod to be adjusted in the center of the cylinder without the use of packing behind the boxes as the connecting rod wears shorter.

The boilers are built of American boiler plate. The smoke chamber is formed by the extension of the boiler shell. The steam dome has recently been enlarged. The boilers are sometimes provided with cone grates and fronts especially fitted for burning spent tan bark, sawdust, and shavings. In such cases the grate is set on a level with the floor, the ash-pit below it, and the door hung on hinges with a chain and weight. In this way fuel may be supplied to the furnace with a scraper. One side of the furnace is kept burning brightly while the other has time to thoroughly dry and ignite its fuel without suffering the fire to burn low.

The grounds occupied by the works have a frontage of 380 feet on the Erie canal. On this side of the works is a yard which extends to the edge of the canal, where coal and other materials brought by water are unloaded.

Adjoining the office, and, like it, fronting on Fayette street, is the draughting room. Leaving the office and proceeding back toward the canal, one enters a large machine shop, 165 feet long and 45 in width. This room has one line of shafting, and here the heaviest work is done. One planer in this room is 30 feet long, and will take in a piece of work 4 feet high. At the extremity of the shop is a long room, measuring 100 by 23 feet. In this room is a large planer. In the machine shop is a lathe which will swing 5 feet and take in 20 feet. There is also a lathe made in the works for turning fly-wheels. The face plate is 12 feet in diameter and cost about \$5000. It will swing a piece of any dimensions, the only limits being the ground in one direction and the roof in the other. Beyond the machine shop is the boiler shop, 70 by 120 feet in dimensions. Near to this room is the steam forge, situated in a separate building. Here are two heating furnaces in which the scrap iron is heated and made into blooms, and hammered under one of Dudgeon's 12 inch hammers, after which the strips are cut up, piled, and passed through three or four

heats, and cut up, piled and hammered again, as many times as are necessary. In this way the cranks are made. This forge is 38 feet wide and 78 in length.

The foundry is near the forge, and is 80 by 90 feet in dimensions. It is heavily built. The principal beams of the roof are of pine. Each is 80 feet long, and contains 1000 cubic feet of timber. Two cupolas are here, which have an aggregate capacity of about eight or nine tons. The iron used is taken mostly from the Franklin, Clinton and Onondaga iron works. Some Lehigh iron is used. The company prides itself upon the unusually clean character of its castings. The pattern store room contains a remarkably large stock of pulley patterns. The engine is horizontal and of 80 horse-power. Its cylinder is 16 by 24 inches. The fly-wheel is 10 feet in diameter and weighs 3500 pounds. The belt is 14 inches wide.

Another machine shop is located on the second story of the main building, and in this room every available space is occupied by machinery. The latter is, however, so arranged that the work, in being passed through the various operations, does not require much shifting backward and forward, but is moved gradually along from one end of the shop to the other.

Postal Absurdities.

The Philadelphia Trade Journal expresses the following sensible views concerning the incongruities of the present postal law:

So general has been the expression of disapproval against the enactment, last winter, of the law which doubled the postage on third class mail matter, that Congress will scarcely hesitate in repealing it at a very early period in the present session. The surreptitious manner in which the clause was incorporated into the appropriation bill, at the last hour of the session, and in a form to disarm all suspicion of the true intent of the instigators and advocates of the measure, would in itself be sufficient ground for its repeal, and, if "the eternal fitness of things" were considered, the repeal should be effected in such a manner as to carry with it a sharp rebuke to those responsible for its introduction.

It will be remembered that this measure was introduced in the senate by Mr. Hamlin, during the consideration of the appropriation bill, which had been passed by the house; it was done in the form of an amendment to the clause in the postal law, fixing the postage of third class matter at one cent for every two ounces. Mr. Hamlin's amendment provided for the substitution of the word "one" for the word "two," before "ounces;" so simple did this appear that no objection was raised, and when the bill went back to the House, for concurrence in the Senate amendments, not a question was raised as to the intent or effect of the innocent clause, which occupied less than two lines in the bulky bill, and it became a law. The result exceeded the anticipations of the inventors of this ingenious piece of strategy, and aroused the legislators, who had been caught napping, and as we have already suggested they will probably hasten to undo their work.

Cheap postage has come to be considered one of the most important means, under the control of our government, for the advancement of our civilization, and any step backward will be discountenanced by the whole people, while but few would object to a further reduction and simplification of the service.

The failure of the postal department to become self sustaining is due in a great measure to the cumbersome and unbusiness-like manner in which its affairs are carried on, while the growing dissatisfaction at the constant changing in the laws, governing the business results from the multifarious array of rules and regulations governing the merest details of the business.

Viewed from any standpoint, the classification of matter passing through the mails is an absurdity, and when this classification involves the scrutiny and inspection by the postmaster of matter under certain classes, it becomes ridiculous. So long as the government is not held strictly responsible for the safe delivery of matter, why should it insist upon making a distinction as to what it carries? Of course, it is not meant that no limit shall be made, and that the mail bags shall become receptacles for all manner of wares and merchandise, but why should there not be one single rate of postage, and that the minimum, for all classes of matter allowed to be conveyed in the mail. This would so simplify matters that a large percentage of expense attending the transaction of the business would be done away with and the constant necessity for additional legislation to cover new points and fine drawn rulings would cease. With the data in possession of the department, it would be an easy matter to establish a uniform rate, and there would be no better time than the present to make this change, which would become to be regarded as an epoch in the history, and a stride ahead toward the attainment of that high standard of excellence, in our form of government, that we shall hear so much about during the coming Centennial year.

The Union Furnace Company, Taunton, Mass., are again at work and running on full time. The company's trade for the year shows a slight falling off from that of last season owing, in great part, to the low prices now prevailing. Their trade thus far for the month of December is in excess of the corresponding month of 1874. The company are doing a large trade in their new "climax" range, which has all the improvements of "mica doors," "anti-clinker grate," "boiler doors," etc. Their leading cook stove is the "Perkins."

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Warren Boiler Works,
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Steam Boilers,
Tanks,
Heaters,
Stacks, Pipe,
And all Wrought Iron work made to order.
ESTIMATES GIVEN ON CONTRACT WORK FOR FUR-
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A Liberal Discount on Boilers to
Engine Builders.
Prices given on application. Address,
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"PEMBROKE"
Round, Square & Flat Iron.
"FRANCONIA" Shafting & Bar Iron.
Extra quality when great strain or superior finish
is required. Also, Irons for ordinary work, like the
"ENGLISH REFINED."
WM. E. COFFIN & CO.,
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ASA SNYDER,
Importer of Scotch, and Furnace Agent for the cele-
brated Anthracite and Hot and Cold Blast Charcoal
PIG IRONS.
OFFICE AND YARD:
1008, 1010, 1012 and 1014 Cary Street,
Richmond, Va.
Orders for Scrap Iron filled.

L. S. TAYLOR. W. M. MITCHELL. C. H. FORD
TAYLOR, MITCHELL & POND,
Manufacturers of
MERCHANT IRON
And Light T. Rail.
Massillon, Ohio.

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Celebrated XX Mineral Facings
P. O. Box 4536.
121 Chambers Street, NEW YORK.

Iron.

PHILADELPHIA.

Iron and Steel T and Street Rails

OF Best American and English Makes.
CHAIRS, SPIKES, FISH BARS,
RAILROAD SUPPLIES.
Muck Bars, OLD RAILS, Scrap,
BLOOMS.

American and Scotch
PIG IRON, AND METALS.
CHAS. W. MATTHEWS,
133 Walnut St., Phila.
[Late RALSTON & MATTHEWS, 133 Walnut St.]

MALIN BROS.,
IRON
Commission Merchants,
No. 228 Dock Street,
3d door below Walnut, PHILADELPHIA.

H. L. GREGG & CO.,
Ship Brokers & Commission Merchants,
Importers of
Old Iron, Metals and Rags.
Freight engagements made to all parts of the world.
Marine insurance effected in reliable offices.
108 Walnut St., Phila.

JUSTICE COX, Jr. & CO.,
Iron Commission Merchants.
Foundry and Forge Pig Iron,
New and Old Rails, Muck
Bar, Scrap, &c.
No. 333 Walnut Street, PHILADELPHIA.

THE CAMBRIA IRON WORKS,

Situated on the line of the Pennsylvania Rail Road,
at the western base of the Alleghany Mountains, are
the largest of their class in the United States, and
are now prepared to make

1800 TONS PER WEEK,
Of Iron and Steel Railway Bars.

The Company possesses inexhaustible mines of
Coal and Ore, of suitable varieties for the produc-
tion of Iron and Steel Rails of

BEST QUALITY.

Their location, coupled with every known im-
provement in machinery and process of manufacture
enable them to offer Rails, when quality is con-
sidered, at lowest market rates.
The long experience of the present Managers,
of the Company, and the enviable reputation
they have established for "CAMBRIA RAILS,"
are deemed a sufficient guarantee that purchasers can,
at all times depend upon receiving rails unsurpassed
for strength and wear by any others of American or
foreign make. Any of the usual patterns of rails
can be supplied on short notice, and new patterns of
desirable weight or design will be made to order
Address,

CAMBRIA IRON COMPANY,
218 S. 4th St., PHILADELPHIA.
or at the works, JOHNSTOWN, PA.

The Phoenix Iron Co.,

410 Walnut St., Philadelphia.
MANUFACTURERS OF
CURVED, STRAIGHT AND HIPED
Wrought Iron Roof Trusses
BEAMS, GIRDERS, AND JOISTS,
and all kinds of Iron Framing used in the construction
of Iron Roof Buildings.

Deck Beams, Channel, Angle
and T Bars
curved to template, largely used in the construction of
Iron Vessels.

Pat. Wrought Iron Columns, Weldless
Eye Bars,
for Top and Bottom Chords of Bridges.

Railroad Iron, Street Rails, Rail Joints and
Wrought Iron Chairs.

Refined Bar, Shafting, and every variety of
Shape Iron made to order.

Plans and Specifications furnished. Ad-
dress
SAMUEL J. REEVES Vice Pres.

The LACKAWANNA IRON & COAL CO.,
SCRANTON, PA.,

(OFFICE IN NEW YORK CITY, 52 WALL STREET.)
MANUFACTURERS OF

BESSEMER STEEL RAILS,
RAILROAD IRON,

Forge and Foundry Pig,
BEST DOUBLE-REFINED MERCHANT BAR IRON,
CAR AXLES AND STRAP RAIL.
ORDERS CAN BE FILLED AT ONCE.

Iron.

Warren Spike Works.

G. W. FAHRION,
Manufacturer of

Railroad, Ship and Boat

SPIKES,

All Shapes and Sizes, Black
and Galvanized.

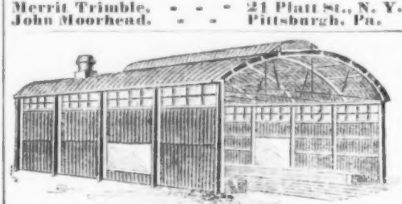
Warren, Ohio.

J. & J. Rogers Iron Co.,
AUSABLE FORKS,
Essex Co., N. Y.

Manufacturers of
FINE CHARCOAL
Blooms & Bars

For Conversion into Cast Steel.
ALSO,
Horse Shoe, Round Square and
FLAT IRON,
Exclusively from Palmer Ore.

Agents:
Merritt Trimble, 21 Phila. St., N. Y.
John Moorhead, 21 Phila. St., N. Y.



Wrought Iron Buildings, Wrought Iron Bridges, Cor-
rugated Iron Roof, Shutters, Doors, Flooring, &c.
Corrugated Sheets of all sizes manufactured by Mosley
Iron Bridge and Roof Co., No. 3 Day St., N. Y.

P. W. GALLAUDET.
Banker and Note Broker,
Nos. 3 and 5 Wall Street,
NEW YORK.

HARDWARE, METAL, IRON, RUBBER, SHOE,
PAPER AND PAPER-HANGINGS, LUMBER, COAL,
AND RAILROAD FUEL WANTED.
ADVANCES MADE ON BUSINESS PAPER AND
OTHER SECURITIES.

Siemens' Regenerative
GAS FURNACE.

RICHMOND & POTTS,
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OLD DOMINION
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RICHMOND, VA.
R. E. BLANKENSHIP, Commercial Agent,
Manufacturer

NAILS AND BAR IRON.
Bands, Scrolls, Horse Shoe Bars, Nut and
Tivet Iron, Spike Rods, Sharpling, Bridge
Bolts, Ovals, Half Ovals, Half Rounds, &c.

W. D. WOOD & CO.'S

PATENT
Planished Sheet Iron.

Patented March 14th, 1865; April 8th, 1873;
Sept. 9th, 1873; Oct. 6th, 1874.

Guaranteed fully equal in all respects to the
IMPORTED RUSSIA IRON,
and at a much less price.

FOR SALE,
by all the principal

METAL DEALERS
In the Large cities throughout

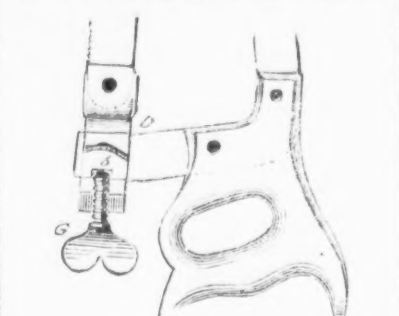
THE UNITED STATES.
And at their Office,
111 Water Street, PITTSBURGH, PA.

New Patents.

We take the following abstract of new pat-
ents, issued November 23, from the official
record:

BUTCHERS' SAW.

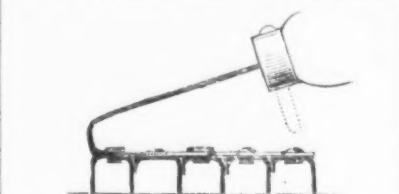
To William Millsbaugh, Middletown, N. Y.—



The combination, with the saw frame A and
blade C, of the loop D, pivoted to the blade,
and the thumb screw G.

CURRY-COMB.

To C. E. L. Holmes, New York, N. Y.—The
metallic connection extending from the handle
to the curry-comb, attached to the comb at the

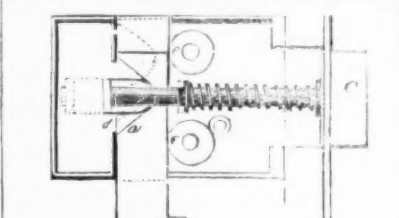


forward part, bent upward and backward over
the comb, and leaving space for the user to
grasp such metallic portion immediately at the
back of the comb.

REVERSIBLE LATCH.

To H. Stirling Pomeroy, New Haven, Conn.—

1. The combination, in a latch case, of the
bolt C, with its tail D, provided with a shoul-
der d, the vertical slide F working through
the edge of the case, and constructed with an
incline or cam shape, substantially as de-
scribed, and so that the vertical movement of

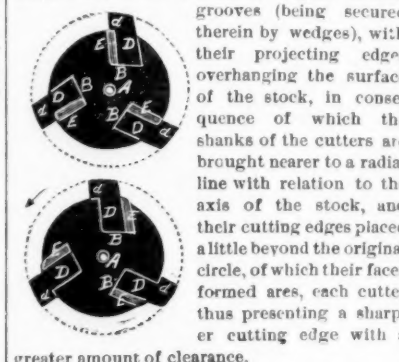


the slide imparts a horizontal movement to the
latch bolt.

2. The combination, in a latch case, of a
horizontal latch bolt, a vertical slide working
in connection with the said bolt, so that the
vertical movement of the slide imparts a hori-
zontal movement to the bolt, the said case
constructed with an opening to receive the
said slide from either edge, substantially as
described, and for the purpose of adapting
the latch to either a right or left hand door.

SCREW TAP.

To Edwin Reynolds, Providence, R. I.—The
cutters, after having had imparted to the face
of each of them a curvature forming an arc of
a circle drawn from the center of the stock,
are removed from the longitudinal grooves and
tempered, and are then placed again in said



greater amount of clearance.
1. A cutter for screw taps, provided with
an overlapping edge d, whereby the face of
the cutter is made wider than its body or shank,
and provision is made for sharpening the cut-
ting edge.

2. The combination of the grooved cutter
stock, the cutters laterally movable in the
grooves of said stock, and the reversible keys
or locking pieces.

3. The combination, with the removable cut-
ters, of the stock A, provided with longitudinal
grooves B and a transverse groove C.

M. Gailletel, the French chemist, has con-
tinued his researches into the absorption of
hydrogen by iron, with some interesting re-
sults. It appears that, when an iron plate is
attacked by sulphuric acid being poured over
it, a portion of the hydrogen produced is ab-
sorbed by the metal, and the pressure of the
gas which is accumulated between two iron
plates, welded together, is sufficient to coun-
terbalance a column of mercury thirteen and
three-fourths inches high. This singular prop-
erty of hydrogen, which has also been con-
firmed, lately, by the investigations of M.
Sevox, is regarded by the latter as a most inter-
esting discovery, and he attributes to the pres-
ence of carbonic oxide, or hydrogenized gas,
the brittleness which some classes of iron man-
ifest when an attempt is made to draw them
into wire—a fact well known to workers in this
metal. It is also found that, when decomposing,
by the galvanic battery, a solution of chlorate
of iron to which sal-ammoniac has been added,
metallic iron may be collected at the South Pole
in the form of a brilliant wart, brittle and often

hard enough to scratch glass. This iron, after
being washed, evolves, either under water or
another liquid, numerous bubbles of a gas,
which is pure hydrogen. When freely exposed
to the air, galvanic iron loses only a portion of
its hydrogen; under water, especially water
heated to 140° or 150°, the hydrogen is given
off with violence. As to the quantity of hy-
drogen iron thus treated can take up, it seems
that for one volume of iron, the amount is 200
volumes of gas; in weight, 13 parts of iron
absorb one part of gas. When a lighted match
is applied to this iron, saturated with hydrogen,
the gas burns like alcohol.

Reorganization of Wm. Jessup & Sons,
Sheffield.

The Sheffield Telegraph says: The share cap-
ital of Wm. Jessup & Sons, limited, Brightside,
Soho, and Park Works, Sheffield, is fixed at
£400,000, in 8000 shares of £50 each, to be
called up as and when required. It is estimated
that about £30 per share will be required to be
paid during the first year, of which £10 per
share will be payable on allotment. Further
calls not exceeding £10 per share at intervals
of not less than two months. It is stipulated
that shareholders may after allotment buy up in
full at their own option, and receive interest
half-yearly at 5 per cent. on the amount in ex-
cess of that called up for the time being. The
directors are H. R. Balstone, Esq., Manchester,
chairman; Joseph Slagg, Esq., Sheffield, deputy
chairman (brother-in-law of Mr. Jessup);
Montague Stevenson, Esq., Sheffield (nephew
of Mr. Jessup); and Joseph Burdakin, Esq.,
Sheffield, managing directors; Thomas Rose,
Esq., J. P., Manchester; John Hall, Esq., Nor-
bury, Sheffield; W. G. Blake, Esq., J. P., Shef-
field (son-in-law of Mr. Jessup); Mr. Balstone,
the chairman, having a very large stake in the
concern, more than one-eighth of the whole
share capital. The directors have already signed
articles for the amount of the capital, and the
bargain is considered an exceedingly favorable
one for the purchasers. The bankers are: The
Sheffield and Rotherham Banking Company,
Sheffield; Messrs. John Stuart & Co., Manches-
ter; the National Bank of Scotland, London,
Edinburgh, and branches. The solicitors are
Messrs. Broomhead, Wightman & Moore, Shef-
field; and Mr. H. T. Chambers, 65 Moorgate
street, London. The auditors are Messrs. Chad-
wick, Adamson, Collier & Co., London and
Manchester. As we have already stated, Mr.
David Chadwick, M. P., senior partner in the
firm, was the purchaser of the business. A
circular will be issued this evening by Messrs.
Chadwick, Adamson, Collier & Co., of which we
are in a position to give the particulars. The
circular states that the company is intended to be
formed by private subscription for the purpose
of purchasing the old established works of
Messrs. Wm. Jessup & Sons, Sheffield, whose
reputation for the production of fine steel of
the very best brands extends to every civilized
country in the world. It need scarcely be men-
tioned that Jessup's steel, for tools, saws, steel
pens and all purposes in which the purest qual-
ities of metals are required, has for nearly half
a century maintained the highest reputation.
The circular goes on to state that upon the death
of Mr. Sidney Jessup, in 1872, Mr. Thomas
Jessup was left the sole proprietor, and he has now
determined, in consequence of his age, and after
forty years' successful connection with the
works, to retire altogether from business. Mr.
Jessup has agreed to sell to Mr. D. Chadwick,
M. P., all the estate and interest in the firm
of William Jessup & Sons in the business, includ-
ing the freehold and leasehold property, to-
gether with the goodwill, trade-marks, engines,
machinery, tools, and plant and all the stock
on hand, without any payment for goodwill,
and to transfer, without extra charge, all the
valuable contracts now existing for the pur-
chase of bar iron and orders on hand for the
sale of steel; but the sale does not include any
freehold or leasehold property in America, nor
any debts owing to or by the firm. Mr. Charles
Unwin, architect and surveyor, of Sheffield,
having shortly after the death of Mr. Sidney
Jessup made a valuation of all the land and
buildings of the firm in Sheffield, and such
valuation, amounting to £84,480, having
been made without reference to any con-
templated sale, it has been agreed to
adopt the same. The 29 acres of freehold land
included in the above are valued at 21. per yard,
of £800 an acre. (This land is supposed to be
worth twice the price asked.) All the stocks of
steel and iron at home and abroad (the circular
proceeds to state) will be taken at the valuation
of Mr. Alderman Tozer, the master cutler of
Sheffield, on the basis of the cost price of pro-
duction on the day of transfer, due allowance
being made for the reduced rate of wages and
the reduced price of coke, coal, &c.; and al-
though such stocks, whether at home or in
America, may have been produced at a greater
cost, no allowance whatever will be made for
such greater cost of production; but stock in
America will be charged with the cost of car-
riage, freight, government duty and insurance
at the rates actually paid. The machinery,
tools and general plant will be transferred on
the valuation of Mr. W. H. Walker, of Messrs.
Walker, Eaton & Co., engineers, Sheffield, as
between an incoming and an outgoing partner
of a going concern, having due regard to their
character and condition, and the wear and tear
they have undergone. In the event of the val-
uations exceeding £400,000, Mr. Jessup has
agreed to reduce the purchase money to that
sum by selecting and removing Swedish bar
iron and finished stock in England at valuation
prices. He will, however, give the company
the option of taking to the whole or any part
of the stock thus selected, and removed at any
time within six months thereafter at the same
valuation prices, with interest after the rate of
5 per cent. per annum added thereto. Mr.
Jessup has also agreed to accept payment of
£200,000 in cash, by instalments, extending

over twelve months, and to leave the balance
of the purchase money on mortgage of the
property for seven years at 5 per cent. interest.
The books and accounts have been placed at
the disposal of Messrs. Chadwick, Adamson,
Collier & Co., and, from an examination of
them, it appears that the business has been
continuously profitable, and that if the future
profits of the concern equal the average annual
profits for the past ten years, they will suffice
to pay on the estimated called up capital of
the company a very satisfactory annual dividend,
after paying interest on the mortgage and all
charges, and allowing, in addition, to the
total purchase money of £400,000, a fur-
ther sum of £50,000 for working capital. Mr.
Montague Stevenson (a nephew of Mr. Jessup)
one of the present managers of the works, and
Mr. Joseph Burdakin, the cashier and financial
manager, each of whom will subscribe for a
substantial portion of the capital of the com-
pany, have agreed to accept the office of joint
managing directors. It is also intended to con-
tinue the services of the present managers of
departments at the works, and of the agents at
home and abroad. With the view of equalizing
the dividends, the surplus profits beyond 10 per
cent. per annum will be carried to a reserve fund
till it amounts to a sum equal to one-half the paid
up share capital of the company. The property
will be transferred to the company on and
from January 1st, 1876, on the exact terms
payable to Mr. Jessup, who, in consideration of
having made so liberal a bargain and given up
all claim for goodwill and the value of orders
in hand, will not himself pay any commission
or other charges in connection with the sale and
transfer of the concern. The company will,
therefore, be charged with a sum equal to 1½
per cent. on the estimated total purchase money
to cover all agency, brokerage and commission
in connection with the purchase of the concern
and the formation of the new company. The
only agreement entered into is dated 9th De-
cember, 1875, and made between Thomas Jessup
of the one part, and David Chadwick, M. P., of
the other part. Copies of this agreement and
of the articles of association of the company
may be seen on application at the offices of
Messrs. Chadwick, Adamson, Collier & Co., or
at the offices of Messrs. Fretson & Son, the
vendor's solicitors, Sheffield; or the offices of
the solicitors to company in Sheffield and Lon-
don. The circular states in conclusion that all
applications will be considered in the order of
their date, and as a considerable portion of the
amount required must be reserved for custom-
ers, friends and agents at home and abroad, im-
mediate application is requested on the part of
those who wish to have any portion of the
capital allotted to them.

A Scrap of Early Railway History.

A recent number of the Philadelphia Sunday
Dispatch says:

"Of similar interest was an experiment by
Thomas Leiper, in order to show the uses and
importance of railroads for the purposes of
transportation. The experimental railroad—
the first ever laid down in America—was set up
in September, in the large yard attached to the
Bull's Head Tavern, in Third street, above Cal-
lowhill, in the Northern Liberties. Professor
Robert Patterson, of the University of Pennsylv-
ania, Callender Irvine, Superintendent of the
United States Mint, and John Glenn, agent for
Thomas Leiper, certified that they were 'pres-
ent at a satisfactory experiment by Thomas
Leiper, of this city, of the great utility of rail-
roads for the conveyance of heavy burdens—an
improvement which, a few years ago, was in-
troduced into England and some other parts of
Europe—as in many cases a cheap and valuable
substitute for canals. In the above experi-
ment a railroad was laid of two parallel courses
of oak scantling, about four feet apart, sup-
ported on blocks or sleepers about eight feet
from each other. On this railroad, which had
an ascent of one and a half inches in a yard, or
two degrees and twenty-three minutes, a single
horse, under the disadvantage of a path of
loose earth to walk on, hauled up a four-
wheeled carriage, loaded with the enormous
weight of ninety-five and a half hundred, or ten
thousand six hundred and ninety-six pounds."

"Reading Howell certified that he had seen
'Thomas Leiper's newly made truck wagon
fixed on the railroad, about twenty-one yards
long, for the purpose of making experiments in
the Bull's Head Tavern yard, Northern Liber-
ties, on the 31st of July."

In the notice of these experiments in the
United States Gazette, of September 29th, 1800,
it was said:

"Nor can we close this brief notice of an
interesting work without paying a merited tri-
bute of applause to the patriotic enterprise of
the gentleman who has been the first in Amer-
ica to engage in it; and we hope he may derive
as much advantage from it as such an ex-
ample to the public fully entitles him to."

But Mr. Leiper was not content with the
mere demonstration of a theory. He desired
something practical. In the Autumn, of Sep-
tember 27th, Thomas Leiper and George G.
Leiper invited proposals for contracts 'for
digging part of a railroad from our quarries on
Crum Creek to our landing in Ridley, Delaware
county. The distance and level, ascertained
by Reading Howell, is exactly three-quarters
of a mile.' They also desired to contract for
making and laying the rail part of the same,
consisting of wood. Specifications were to be
furnished by Large & Winpenny, at their man-
ufacture, adjoining the Bull's Head tavern,
Northern Liberties."

England exported 44 tons of railroad iron to
this country in November last, against 1819 tons
for November, 1874. Her total exports of rail-
road iron to the United States for the eleven
months ending November 30th, have been
17,755 tons, against 93,445 tons for the cor-
responding period last year. Great Britain no
longer holds mastery over our ways.

Iron.

CLEVELAND.

CLEVELAND ROLLING MILL CO.,
MANUFACTURERS OF
BESSEMER STEEL RAILS,
Plates and Forgings, Railroad Iron, Merchant Bar,
Beams, Girders, Splices, Bolts, Spikes, &c., &c.
Office, Nos. 39 and 101 Water St., CLEVELAND, O.
A. B. STONE, Pres. H. CHISHOLM, V. P. & Gen. Supt.
E. S. PAGE, Sec'y.

Cleveland, Brown & Co.
IMPORTERS, MANUFACTURERS AND DEALERS IN

IRON AND STEEL,

**HORSE SHOES, HORSE NAILS,
NORWAY NAIL RODS,
NAILS, SPIKES,**

"Standard Taper" Axles & Swedes Iron.

WINDOW GLASS,

Wrought Iron Pipe and Boiler Tubes.
Nails, Rivets, Nuts, Washers, and Heavy
Hardware Generally.

25 27, 29 & 31 Morwin Street,
CLEVELAND, OHIO.

The Iron-Masters' Laboratory.

Exclusively for the Analysis of Ores of Iron,
Pig and Manufactured Iron, Steels, Limestone,
Clays, Slags & Coal for Practical Metal-
lurgical Purposes.

No. 339 Walnut Street, Philadelphia.
J. BLODGET BRITTON.

This Laboratory was established in 1866, at the instance
of a number of practical iron-masters, expressly to afford
prompt and reliable information upon the chemical com-
position of the substances above mentioned, for smelting
and refining purposes. The object being to make it at
once a convenient, practically useful, and comparatively
inexpensive adjunct to the Furnace, Forge and Rolling
Mill.

CHARGES TO IRON WORKS.

For determining the per cent. of Pure Iron in an
ordinary Ore..... \$4 00
For the per cent. of Pure Iron, Sulphur and Phos-
phorus in do..... 12 50
For each additional constituent of usual oc-
currence..... 1 50
For those of unusual occurrence or difficult to de-
termine, the charge must necessarily depend
upon circumstances.
For determining the per cent. of Sulphur and Phos-
phorus in Iron or Steel..... 14 00
For each additional constituent of usual oc-
currence..... 6 00
For the per cent. of Carbonate of Lime, and in-
soluble Silicious Matter in a Limestone..... 10 00
For each additional constituent..... 2 00
For the per cent. of Water, Volatile Combust-
ible Matter, fixed Carbon, and Ash in Coal..... 12 50
or determining the constituents of a Clay, Slag,
Coke, or of an Ash of Coal the charges will correspond
with those for the constituents of an ore.
For a written opinion or letter of instruction the charge
must necessarily depend upon circumstances.
Printed instructions for obtaining proper average sam-
ples for analysis furnished upon application.

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CHARLES A. JOY, Ph. D., General Chemistry.
WILLIAM G. FEE, LL. D., Mechanics and Mining
Surveying.
JOHN G. VAN AMRINGE, A. M., Mathematics.
OGDEN N. ROOD, A. M., Physics.
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ogy.
The plan of this school embraces a three years' course
for the degree of ENGINEER OF MINES, or BACHE-
LOR OF PHILOSOPHY.
For admission, candidates for a degree must pass an
examination in Arithmetic, Algebra, Geometry and
Plain Trigonometry. Persons not candidates for degree
are admitted without examination, and may pursue any
or all of the subjects taught. The next session begins
October 2nd, 1876. The examination for admission will
be held on June 23d, and September 26th, 1876. For fur-
ther information and catalogues, apply to
DR. C. F. CHANDLER,
Dean of the Faculty.

WALLACE & HUMPHREY, Analytical Chemists,

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Special attention given to analysis of Iron and Steel.

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Experts in Iron and Analytical Chemistry.
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452 Franklin St., BUFFALO, N. Y.

Iron.

THE MILWAUKEE IRON CO.

Manufactures and Offers For Sale

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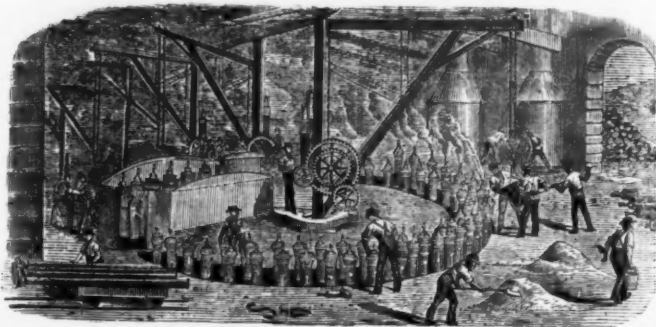
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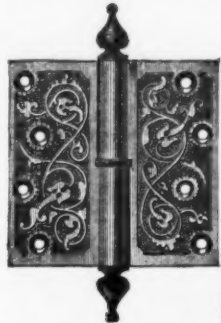
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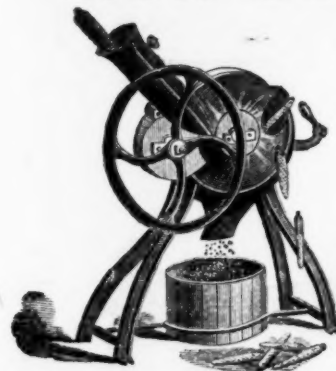
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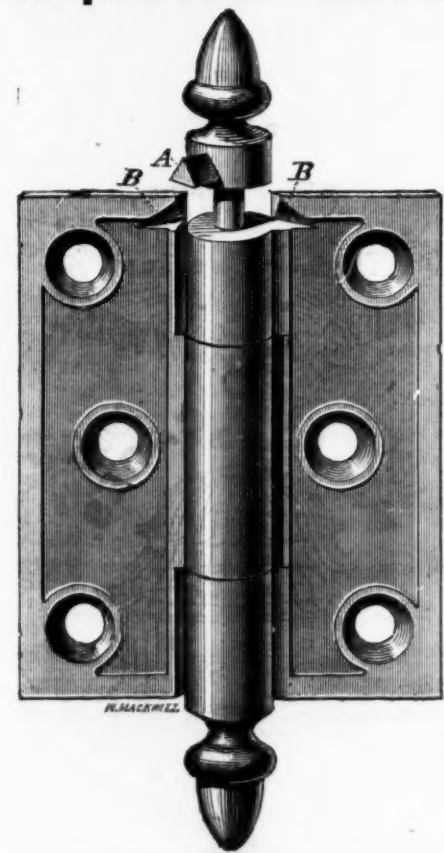
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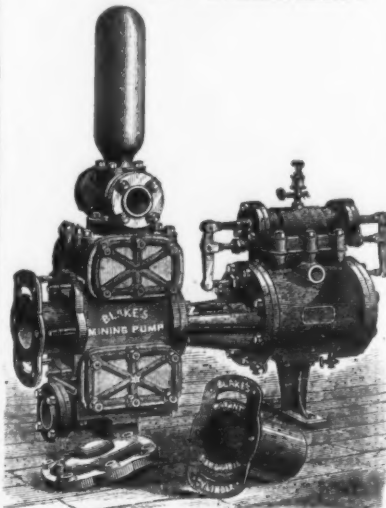
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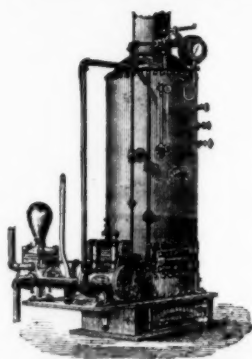
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England at Philadelphia.

In the *London Gazette*, of Friday last, was published a list of the intending English exhibitors at the International Exhibition to be held at Philadelphia next year. This list does not include any exhibits of fine arts, horticulture, or live stock, and it is exclusive of contributions from the colonies, but otherwise we presume it may be regarded as practically complete, since those few exhibitors who will be admitted at the eleventh hour, will probably take the places of those who will fail to exhibit at all. About 700 of all classes—with the exception of those above named—are included in the list, but we observe with regret that by far the greater proportion of this number propose to send to Philadelphia objects of very minor importance, samples rather of special trade produce, than types of representative industry. The number of exhibitors of machinery is under thirty, and only a part of these propose to send objects of much real interest. Steam engines are to be sent only by Messrs. Aveling & Porter, who propose to send a traction engine, crane and road roller; by Messrs. Appleby Brothers, who will exhibit a steam crane; and by Davey, Paxman & Co., who have entered a small steam engine and boiler for exhibition; while Ransome, Sims & Head have applied for space for their straw burning portable engine. Steam boilers will be represented only by Messrs. W. J. Galloway & Son. Agricultural implements are to be shown by two firms: Davey, Paxman & Co. with their corn dryer, and J. P. Fison, with thrashing machines and plows. Railway signals will be contributed by three or four manufacturers, and Mr. C. W. Siemens' name is entered as an intending exhibitor of a metallurgical furnace. Mr. E. Green will show his economizer, and Messrs. Cammell & Co., and Sir John Brown & Co. will exhibit samples of armor plates. Several important printing machines will be sent to Philadelphia, amongst others the Walter and the Victory presses, while small arms will be represented by numerous makers. Three or four coal cutting machines, and a few textile machines practically complete the list of mechanical subjects. On the other hand scientific and horological instruments will appear in fair numbers, as well as artificial manure, building materials, fire and other clays, carriages, fabrics, photographs, and food preparations; but the whole list is a very poor and unsatisfactory one, and leads us to expect but little of the English display. That the contributions are so meagre is much to be regretted, because although, at the present time, the United States offer but a poor and partial market by reason of prohibitive import duties, the exhibition of Philadelphia will be crowded by wealthy visitors from other countries, where such duties do not exist, and with whom English exhibitors would secure large and profitable business, which must now of necessity be transferred to American manufacturers, who could not compete in the open market with English makers. For every reason, therefore, it is to be deeply regretted that in so great an exhibition as that will be next year, this country will take so small a share. At Vienna it was far different, for there amidst numerous difficulties which will not be known at Philadelphia, we made a most successful if not a very large show, and the British section, both as regards its exhibition and commission, took a leading place. How well that commission performed its arduous work, in spite of the greatest pecuniary and other difficulties, and how Mr. P. C. Owen devoted himself incessantly to the interests of exhibitors, is now almost a matter of history, and it was hoped that at the coming Centennial celebration, England would be as well represented, if not by her manufactures, at least by her official commissioner. A liberal money grant had been awarded to the commission, and the feeling on the other side of the Atlantic, from the first one of warm friendliness, had been kindled into something very like enthusiasm, thanks only to Mr. Owen, who brought the commission at Vienna so satisfactorily through its difficulties, and who had been prevailed upon to accept an equally onerous post at Philadelphia. It is with a feeling, therefore, of deep regret that we find Mr. Owen has resigned the position he had thus undertaken. Why he has done this, it is not our province to inquire, but we know that his resignation will be at once a disappointment to the exhibitors and a loss to the country, whilst this feeling on the other side of the Atlantic has been already made public. We think we state the belief of all those exhibitors who had experience at Vienna, that Mr. Owen is the only man in whom perfect confidence could be placed for this work, while the unknown and untried delegates who step into his place appear to have no special qualification for the position. Setting aside his administrative capacity, he had learned those lessons which are indispensable for a thoroughly efficient commissioner, and which can be only acquired by experience. The joint commissioners, who succeed him, no doubt possess the raw material out of which the requisite administrative qualities and sound judgment may be fashioned, but their names carry no weight, their past positions bring not a shade of influence to help them in their coming duties, and we fear they will be found wanting in those characteristics essential to a successful completion of the work intrusted to them, and which Mr. Owen possesses to so marked a degree. It is true that their duties at Philadelphia will probably be comparatively light, and so may possibly be performed, if the assistant staff be efficient, without actual dissatisfaction to the exhibitors, but the English Commission at Philadelphia should have a higher aim and wider scope than mere routine work—the establishment of firmer and more mutually beneficial relations between the two countries. Had Mr. Owen not resigned we feel

sure that this aim would have been achieved, but now we fear it will not be even attempted. —*Engineering.*

Chinese Riots in Nevada.

The Virginia (Nev.) *Enterprise* of the 23d tells the following story:

About 3:30 o'clock yesterday afternoon another fight suddenly began in the Chinese quarter of this city. This was not unexpected, as it has been well known to all who have observed the actions of the Chinese since their late big fight that they were only resting on their arms and were liable to open hostilities at any moment. The feeling existing among the members of the rival companies is exceedingly bitter and is constantly growing worse. As before, the fight is between the members of the Sam Sing, Hop Sing, Hop Wo, and some smaller companies that are arrayed with either the Sam Sing or Hop Wo Company. How the battle opened does not very clearly appear, but most of the Chinamen with whom we conversed asserted that it began with the firing of a shot from a loop-hole in one of Sam Sing's buildings, which shot struck and seriously, if not fatally, wounded a Hop Sing man named Ah Ying. This man, Ah Ying, was passing quietly along a back street in the eastern part of Chinatown when he was shot through the back of the neck and fell just at the side of a cabin belonging to a member of his company. With this men of all parties who were in the neighborhood rushed to arms, and the firing became general. They appear to have drawn their pistols in all parts of the town and turned loose on their enemies wherever they appeared; but the hottest part of the fight was in the eastern portion of their town. At this point three houses were loop-holed, the loop-holes generally being from 6 to 10 inches square, though some were holes that appeared to have been bored with a 2 inch auger. These holes were made at a convenient height to be used by persons inside of the buildings, and appear to have been cut two or three days ago. These buildings all belong to Sam Sing men, and in them, as is asserted, were a number of "fighters" from Sacramento, Carson City and Reno. The Hop Sing men had feared these loop-holed houses for two or three days, and had been careful not to go near them either by day or by night. That danger lurked within them is shown by what befell Ah Ying. The Hop Sing headquarters appear to have been in a row of three or four frame buildings, about 50 yards to the eastward of and facing the fortified houses of Sam Sing. When the fight began, the Hop Sing men came out of their houses with shot guns and blazed away at the loop holes in the building of Sam Sing. Some of the Hop Sing men, such as were armed with revolvers, fired from the narrow alley ways between the houses. They would fire a shot, then fall back and cock their pistols, when they would come to the front and fire again. A gentleman who was in the neighborhood counted the shots until they numbered 26; there were probably in all some 50 shots fired, some of which, however, were by white men, who were skirmishing about the edges of the battle. The noise of the battle, the banging of the guns and pistols, and the "shouting of the captains," brought a large crowd of white men down from the city, but they halted on E and D streets. They remembered that a white man was wounded well up town on the occasion of the last battle. Persons residing in the neighborhood, however, were involved in the thick of the fight for a time. Some of these took down their guns and turned loose among the Chinamen. Gradually the fighters took to their heels, as white men began to appear upon the scene in considerable numbers, and the results of the battle were then ascertained. They were Ah Ying, shot through the back of the neck; another Hop Sing, wounded in four or five places on the back and shoulders with buckshot; and a man (name and party unknown to the whites) shot through the right arm above the wrist. The Chinese of the Hop Sing fact on say that a man of the Sam Lee, or some such company, was shot through the leg. He was just coming into the town with a donkey loaded with wood as the fight began. Seeing a man about to fire at him, he cried out to him to hold on, that he was a friend of his company. An enemy of said company acted upon this announcement by shooting the unfortunate wood pedler through the leg. The man was friendly toward the Hop Sing and a Sam Sing went for him. The arms of the Chinese were of all kinds. They had all manner of pistols, a number of shot guns and a few repeating rifles. In one house a miner's dinner pail half full of rifle cartridges was found. Had they been allowed to have things their own way the Chinese would probably have fought all the afternoon, as they were but beginning to get warmed up to their work when the whites "clipped it." The majority of the shot guns appear to have been in the hands of the Hop Wo and Hop Sing men, and it was doubtless for this reason that the Sam Sing men cut loop holes in their houses, as they could then fire from behind planks through which ordinary shot would not penetrate. The charges withdrawn from some of the captured guns showed them to have been loaded with a small handful of goose shot mixed with five-shooter balls and buck shot—with plenty of powder behind all to do good work. Twenty-one prisoners were captured and lodged in the jail last night. The charges entered against them were "disturbing the peace." Although it was known that the shot which struck Ah Ying was fired from one of the Sam Sing houses no one could say who fired it. Some of the loop holes were smoked with powder, showing that the ends of guns or pistols had rested in them. At last accounts Ah Ying was still alive, and it was thought he might recover. The wounds of the other men are not considered to be of a very serious character. Evidently the Mongolians are still on the war path, many of those seen about the battle ground after it came into possession of the whites were haggard and venomous faces, and were restless, nervous and jerky in action. Had it been moonlight there would doubtless have been more fighting last night. It was well understood in Chinatown night before last that a fight would take place yesterday, to-day or very soon. There were hints about the city last evening that the "601" would most probably go down last night and bang the head man of the several companies, as the only means of putting a stop to these dangerous Mongolian battles.

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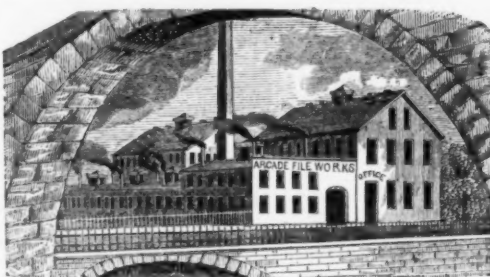


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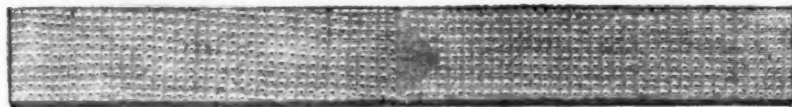
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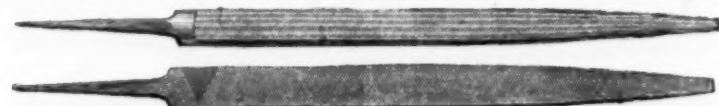
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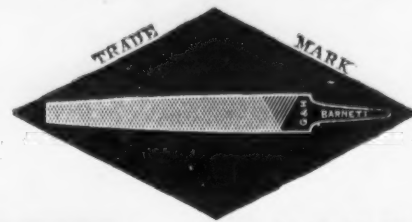
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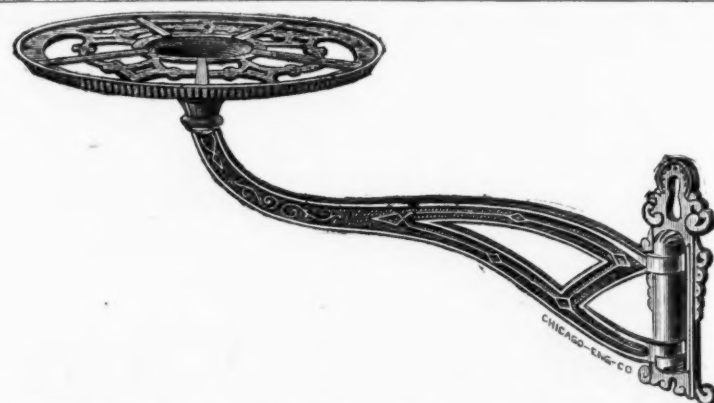
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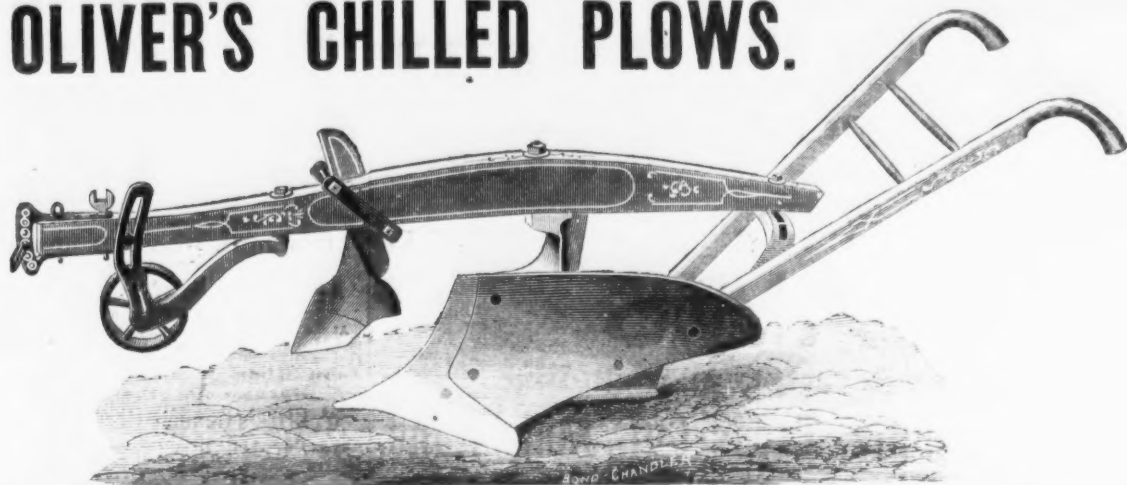


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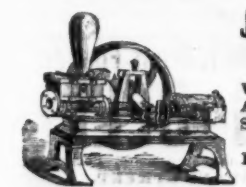
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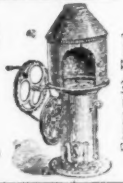
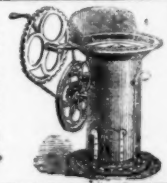
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The Mineral Resources of Ireland.

It has been a thousand times repeated, and often even by statesmen and economists, that Ireland has been left by nature so poor in mineral resources that she must for ever continue a mere agricultural country. That the geology of Ireland in its great features, most of which consist of the carboniferous limestone and still lower deposits, presents but little resemblance to that of England, every leaf of whose multiplied and varied geological book when turned over presents some special feature and foundation for industry, is no doubt true. But there is, probably, no habitable region of our globe as to which it can be said with truth that it is so deprived of all mineral resources that it must forever remain confined to tillage and grazing. A great deal of technical knowledge, as well as energy, thriftiness and the mercantile tendency to make out how a penny may be turned even under the most unfavorable conditions, are needed to develop the mineral resources of any country, and these are the more needed in proportion as these resources are naturally limited; and it is to the general absence of these qualities amongst all classes of the inhabitants of Ireland, as well as the chronic strife that divides her social condition, more than to the real poverty of resource afforded her by nature, that so little addition has hitherto been made to her wealth in adding to the treasures which are yearly won from the surface of her soil by carefully looking for and extracting those that lie beneath it. Were we to treat at length of this phase of the social condition of Ireland, it would be an easy, though a painful task, to point out the contrast presented by many of the great land owners of Great Britain in aiding to the development of the wealth beneath their vast estates, thus adding to their own revenues and diffusing riches all around them, with that of nearly all the great land owners of Ireland, so many of whom are still absentees, and so few of whom are willing to risk capital, or have themselves the requisite knowledge to direct its application, or in any other way, to assist in developing new sources of wealth otherwise than by the agricultural labors of their tenantry. One remarkable and encouraging exception to this exists in the growing and already great trade in iron ores which has been developed in the counties of the province of Ulster, Londonderry, Antrim and Down, the circumstances of which are remarkable and little known.

The iron ores of Ulster are almost free from sulphur and phosphorus; in most instances they are not true red hematites, but rather iron ochres, in which the alumina and a small quantity of lime present are advantageous in relation to the conditions in which they are employed for smelting, namely, as additions to the fine red hematite of Westmoreland and Cumberland, the flux employed with which is limestone, which requires the addition of more or less argillaceous matter to form a conveniently fusible slag. It is curious to remark that the prosperity of this mineral industry in the North of Ireland has been promoted in two different ways, and is supported by the local position and circumstances of the iron trade in Westmoreland and Cumberland. Were it not for the proximity to the port of Barrow, and the shipping and disembarking conveniences there to be found, and the easy communication thence by rail with almost the whole of the Westmoreland and Cumberland iron works, the profitable transport of these Ulster ores to the furnaces would scarcely be possible; nor would the trade in Ulster ores to South Wales be so were it not that the ores are taken back at low freights by coal ships that have discharged their cargoes at Belfast. Again, were there a sufficient supply of alumina always found in the hematite beds of Westmoreland and Cumberland, the iron masters there would need but little of the Irish ores, except those of the richest quality. Twenty years back, or a little more, these Irish ores were of small commercial value, and owe their present successful working to the same sorts of adventitious conditions brought about by industrial movements elsewhere, which mark the epoch of development of natural resources of almost every kind and everywhere. Had Ulster, or indeed any not very far distant part of Ireland, an adequate supply of good coal, it might become a great future seat of iron metallurgy, for the coke employed in such vast quantities at Barrow, and between that and Whitehaven, is made at Darlington and transported by rail almost across the whole breadth of the island to the furnaces. Unless by possibility there exist thick beds of coal beneath the carboniferous limestone of Ireland, which is unlikely, though it has never been proved absent by borings, no such supply of coal need be looked for, for the coals of Tyrone, so far as they have as yet been explored, are not sufficient apparently to support a great iron industry, and the lignite of Ballycastle, on the coast of Antrim, is hard to be got at, and probably insignificant in quantity. Of peat of good quality there is an ample supply in Ulster, but its profitable use upon a great scale for metallurgical purposes remains yet to reward the genius of some future Siemens whose method of burning it as a gas producing fuel offer the only chance of making it practically available. Peat has been the subject, especially in Ireland, of so much ignorant experiment and mendacious quackery, of which Dr. Hodges, in his address, has given some curious and instructive examples, that any suggestion for its employment for any purpose higher than the cottager's hearth is now received with suspicion and repugnance by every well instructed technologist. That it is by nature a miserably poor fuel, and poorest and worst in those damp and rainy countries where nature produces it in greatest abundance, is certain; but, though containing at the best,

when air and sun dried, one fourth of its weight of water, it cannot as yet, be said that the absolute impracticability of its economic use upon a great scale, for metallurgical purposes, has been finally demonstrated, and the question never can be decided except by such a combination of scientific skill, with adequate capital, as shall enable it to be tried upon that great scale upon which alone its power as a gas producing fuel can be tested, and upon which its use has any chance of success.

Siemens' method has been applied, and, it is stated, with perfect success, to enable the sawdust of the saw mills of Sweden to be employed as fuel. Why, then, should we despair of peat, before adequate actual experiment has proved the impracticability of its being thus used for iron making? Peat has actually been tried on a working scale as a gas producing fuel in Siemens furnaces, employed for heating large forgings at the works of the Great Southern and Western Railway Company, of Ireland, and with this result—that Ruabon coal, employed in the ordinary reheating air furnace, gave a result about equal to an equal weight of peat burned in the Siemens gas producer, and the comparative effect of equal weights of the same North Wales coal and of peat, both being employed in the Siemens gas producing furnace for heating large forgings to the welding point was as 100 to 57-2. It must be recollected, however, that the peat in this case was in the form of sods of "hand turf," that is to say, of dense air dried peat—see "Transaction Institution Civil Engineers, Ireland," vol. x., 1875. Peat, in the state in which it was most probably used to be employed for iron making, would be in amorphous masses cut from the bog and consumed with but little if any previous air drying. It would, therefore, yield a useful effect as compared with coal of something less than 57 per cent.; probably, however, with suitable gas furnace arrangements a useful effect approaching one-half that of coal might be assumed. It is even not inconceivable that the circumstances of future industry and commerce between the North of Ireland and Great Britain, from the coal field of Glasgow to that of South Wales, might allow of the import of coal to the ports of Ulster under conditions favorable enough to admit of certain forms, at least, of iron making profitable there, and we would commend this question to the attentive consideration of those intelligent and well informed men, some of whose names as those of Dr. Ritchie, the late Mr. Benn and Mr. Crommelin—to whom the establishment of the Ulster iron ore trade owes so much. There are other vast deposits both of hematite and of clay iron stone long known, and at intervals spasmodically worked upon a small scale, around Lough Allen, in the county of Leitrim, and these will probably, if railway communication with Belfast be sufficiently improved, find their way into the English iron districts. There is coal there, too, but of very ashy quality. Dr. Hodges, in the address to which we have referred, though he alludes to the discovery in Ulster of rock salt, gives no particulars of this, which is likely to prove, ere many years have elapsed, of even greater industrial importance than the trade in iron ore, or perhaps, even than its development into iron making.

It is nearly 30 years ago that, as we have heard, in digging a common well on land in the neighborhood of Carrickfergus, salt water was found instead of fresh. After a delay of some years, a boring was made near the spot, Mr. James Thompson, C. E., then a partner with Mr. now Sir, John McNeill, being employed to direct the operations, which resulted, not in the discovery of the brine spring sought, but in that of a tolerably large mass of solid rock salt, with the usual accompaniments of clays, gypsum, &c., characterizing the salt formation. This was the origin of a new staple for Belfast, whence a large quantity of rock salt is now exported for use in chemical manufactures, and employed upon the spot for like purposes. Rock salt, pure good limestone and pyrites, form the bases of chemical manufactures. Two of these Antrim possesses in abundance, and there can be but little doubt that the third—pyrites—exists in great quantities in the tertiary deposits around Lough Neagh, some of the shores of which are thickly strewn with large water-worn nodules of solid pyrites; and if the valuable reports made nearly a century since by various persons, at the desire of the Royal Dublin Society, as to the mineral resources of the different counties of Ireland, may be trusted, there exists in Sawell Mountain—in Tyrone, we believe—a bed of pyrites of immense magnitude. With these achievements and prospects as to the North of Ireland before us, let it not be again affirmed that Ireland must forever remain a mere agricultural country; though, even were that a truth, and were retarding conditions, social and political, removed, she might, by her agriculture alone, become more wealthy and prosperous than Holland, Switzerland, or the great plain of Germany. We may return to this subject hereafter with some remarks upon the neglected mineral resources of other parts of Ireland.—*Engineer*

Old Ironsides.—The Philadelphia Telegraph says: "The work of running the Constitution on the dock took place recently in the presence of a large number of spectators, who good-naturedly withstood the chilliness of the weather for the sake of glancing at this noble relic of the last century. The process of hauling her on the dock was the same as used when she was brought here for repairs, and which worked so successfully. After elaborate preparation the vessel made a slide, causing a shout of 'There she goes!' to go up from those assembled. After moving along smoothly about half her length, she stuck, causing considerable delay. The difficulty was finally overcome, and the famous vessel was firmly settled on her dock. The work was under the superintendence of Naval Constructor Hart and his assistant, John Hoover. A feature of the occasion was the fact of the Constitution having originally been constructed under the supervision of Constructor Hart's grandfather, then his father superintended her rebuilding in 1813, and now the grandson of the original constructor has consented to remain in Philadelphia to superintend the repairs. Among those present were Naval Constructor Hebburn, Frank Glenn, Naval Constructor Hascomb and wife, Mrs. Haubach, of Brooklyn; Commodore Preble, Internal Revenue Collector William B. Elliott, Mrs. Davis, Mrs. Hart, and several others."

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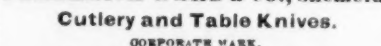
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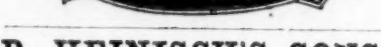
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PHILADELPHIA CORRESPONDENCE.

Office of The Iron Age, 230 South Fourth St., PHILADELPHIA, Jan. 4, 1876.

The past week has been largely of a holiday character, and business confined almost exclusively to the retail departments. The new year has been ushered in with unusual demonstrations of gladness, and hopes are entertained that it will bring with it increased activity in trade, and that the gloom and depression of the past two years is about to be cleared away. In some branches of business there are already indications of improvement, but it will not be safe to anticipate a transformation from the dullness of the past two years to the activity of the war times, or of the two or three years preceding the panic, but there are grounds on which to base expectations of an early revival in general business. Labor is cheaper than for years past, and prices of most articles almost as low as they ever were, while merchants and manufacturers appear to have accepted the position, and are willing to transact business when it can be done safely at smaller margins of profit than formerly. In view of all these facts, it can only be a question of time when the whole machinery of trade will be again in active operation.

In the coal and iron trade there is nothing new to report; stagnation still prevails, and there is nothing doing whatever. This, however, is the usual condition at the close of the year; stock taking and balancing accounts occupying the attention of the trade, and there will probably not be much else doing for the next ten or fifteen days.

The depression which exists in the coal and iron trade is largely participated in by those connected with the railway interests, and in these departments there is still a very gloomy feeling, business being on the most limited scale, and nearly, if not quite, all the leading establishments working on short time, with a greatly reduced number of hands. What little business is doing appears to be on foreign account, our own railways contributing almost nothing at the present time, and so far as we can learn from careful inquiry among those most intimately connected with the trade, the prospects of a speedy improvement are not very flattering.

In the building trade, and those immediately connected with it, there has been a large business done during the past year, in the city, probably quite as much as in any previous year, while the prospects for 1876 are quite encouraging. It is probably true that operators who expected to realize immediately have been somewhat disappointed in the pecuniary results, but this has been the case in every other department, and those who anticipate securing large profits will probably meet with further disappointments, as no doubt in every branch of trade profits will have to be reduced in order to meet the requirements of the times.

In the gas fixture business, our leading establishments have been very actively employed, working up to their full capacity, and report the trade of the past year to have been large, and at fairly profitable rates. The prospects for the coming year are considered quite encouraging, a large local trade is expected, and confidence is felt that this business is upon an entirely safe basis. The manufacture of gas fixtures is an important interest in this city, some of the largest establishments in the country being located here, employing from 300 to 500 men each.

The stove trade report quite a large amount of business having transpired, but at unsatisfactory prices; the leading houses report sales considerably larger than last season, but the universal complaint is that there has been no money made. The same remarks apply to most other branches of trade, viz., that they can do business, but find great difficulty in realizing satisfactory returns.

The trade in tin plates is being carried on very actively, and has already become one of the most important articles among our imports. This trade has of late years concentrated in Philadelphia in a remarkable degree. The difference between its present extent and character and condition four or five years ago shows conclusively that the claim made now, for an acknowledgment of its importance, is only a reasonable one. The increase of direct importations is an index of the volume of trade in plates that Philadelphia has drawn to herself, is likely to steadily increase and permanently retain. The register of exports of tin plates from Liverpool to United States ports furnish the figures for the following comparison: The increase in exports to Philadelphia for November, 1875, as compared with November, 1874, was over ninety-seven per cent., while the corresponding months show a decrease of twenty-one per cent. In the exports to New York. Comparing the first eleven months of 1871 with the first eleven months of 1875, we find the trade has increased two hundred and five per cent. In Philadelphia, while the corresponding months show a decline of over thirty-seven per cent. In New York. Much of this extraordinary expansion is doubtless due to the increased facilities obtained through our line of American steamers, which, with their exclusive direct connections with the great Western lines of railways, offers regular and rapid transmission of goods from foreign ports to the interior of our country.

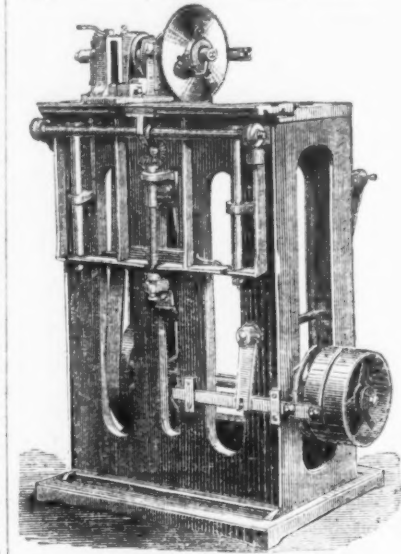
A Railroad in a Canon.

A Colorado correspondent of the New York Tribune says: Probably the most remarkable railroad in the United States is that which connects Golden City with Black Hawk, a distance of 21 miles. It is a portion of the Colorado Central, which runs between Denver and Black Hawk. The entire length of the road is only 33 miles. The first 17 miles are of the usual

gauge, and ordinary in their character. For the remainder of the distance the gauge is three feet. The track is laid in clear creek canon, side by side with that stream, which is very swift, deep and rocky. Before the railroad was projected the creek covered almost the entire surface or bed of the canon. On either side rise to the height of from 1000 to 1500 feet the ragged, rocky peaks of the mountains. To lay the road required the most extraordinary skill and courage. A portion of the bed had to be formed by blasting the immense rocks and laying the track on the foundations thus obtained; sometimes it was necessary to turn the course of the streams somewhat—a most dangerous undertaking—and build a wall of solid masonry upon which to lay the track, and much of the way, so narrow and precipitous is the canon, it was necessary to blast the overhanging rocks, so that room for even the three foot cars might be obtained. It is certainly the most picturesque and remarkable road in the country, running as it does beside a marvelously rapid and turbulent stream, and between spurs of the Rocky mountains, whose ragged peaks are lost in the clouds. The road is new, and the stock is owned, it is said, principally in Boston.

The Hamilton Dovetailing Machine.

We show in the accompanying cut a dovetailing machine invented by Mr. Tighe Hamilton, of Hamvilla, Upper Rathmines, Dublin.



THE HAMILTON DOVETAILING MACHINE.

The remarkable feature in these simple machines is, that they operate by the peculiar motion imparted to an ordinary circular saw, which is easily sharpened, and easily replaced when worn out. The sizes of the tails and pins can be varied from the thickness of the saw, up to any dimensions required in practice. There is, in fact, no limit but the size of the saw—their capacity ranging from the largest constructions down to the finest cabinet work, whilst in all cases the result is absolutely perfect. The operation applies not only to ordinary dovetails, but to miter, invisible or lap dovetailing, and also to dovetailing tonguing and grooving. The machines are of various sizes and prices, according to the work required. Those now being manufactured of the form shown in the cut will cut pins and tails in boards up to eighteen inches wide by one inch thick, or will cut tails in as many boards, placed one on the other, as will make up four inches in thickness, but the corresponding pins must be cut in one board at a time.

The first of these machines were made for the English government, and have been for some time in constant operation at the Woolwich Arsenal with the best results. Mr. H. Simon, C. E., 7 St. Peter's square, Manchester, England, is the general foreign agent for the sale of these machines.

An English "Big Gun."—The second trial of the 81-ton gun after the proof took place on Dec. 10 at the proof butts of the Royal Arsenal, Woolwich, in presence of a distinguished and scientific company. The experiments were under the direction of the Committee of Explosives and the various officers of the Royal Arsenal. The gun was placed at the same distance from the butt as on the previous occasion, the screens through which the shot passed being in the same position as before. The first round was fired with 220 pounds of powder, the grains of which were cubes 1 1/2 inch in diameter, and a projectile weighing 1244 pounds. The velocity of this shot at the muzzle was 1535 feet per second, but the mean results recorded by the crusher gauges showed an expansive force of 34.1 tons the square inch. In the second round the charge of powder was 220 pounds, 1 inch (1.7) diameter, the weight of the shot being 1240 pounds. This diminished the velocity to 1502 feet per second, while the pressure went down to 22.9 tons. Round three consisted of 220 pounds of powder of 2 cubic inches in size, and a shot weighing 1242 pounds. This caused a still further decrease in the velocity, which was recorded at 1485 feet per second, the pressure being 21.7 tons. In the fourth round 220 pounds of powder were employed, the size being 1.7 cubic inch. The velocity was thus increased to 1543 feet per second, while the pressure had only gone up to 22.7; a similar quantity of two-inch powder, with a 1248 shot was used for the next round, and gave a decrease in the velocity to 1498 feet, the pressure advancing to 23.4 tons per square inch. The sixth and last round was fired with 240 pounds of two-inch powder, with a 1247 pound shot and recorded a velocity in the instrument room of 1513 feet per second, and a pressure of 23 tons. The scientific manipulation was in many respects in defiance of several recognized laws of gunnery, but with a decided advantage. So far as the new gun has been tried, its success has been greater than was ever anticipated.

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We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. O. Coes which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped.

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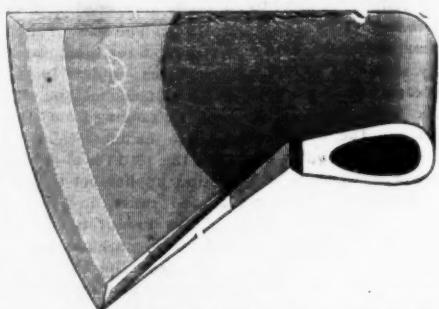
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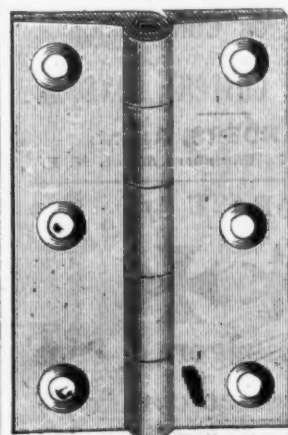
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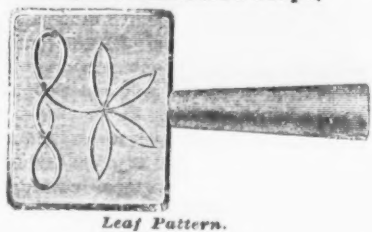
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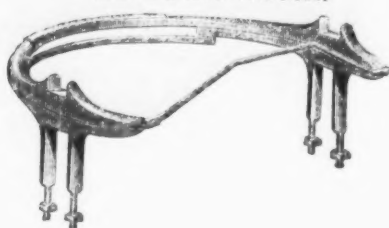
Leaf Pattern.

King Bolt Yokes.



Established 1850.

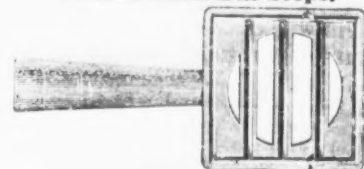
No. 6 Fifth Wheels.



1871 Pattern Shaft Couplings.



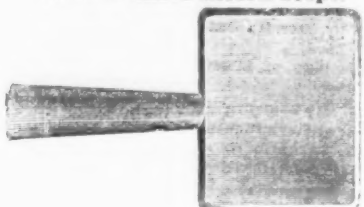
Patent Cross Bar Steps.



Upper View.

Lower View.

Solid Plain Pattern Steps.



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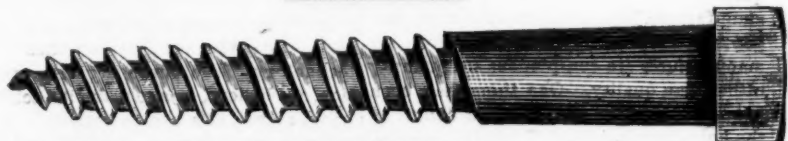
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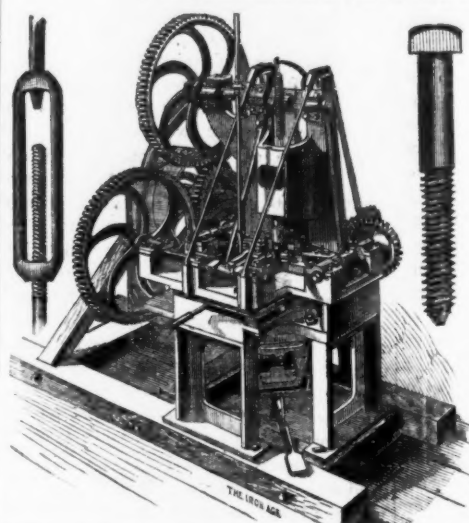
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The Iron Age.

New York, Thursday, January 6, 1876.

DAVID WILLIAMS - Publisher and Proprietor.
JAMES C. BAYLES - Editor.
JOHN S. KING - Business Manager.

New York, January 2, 1875.
Until the 1st instant the postage on newspapers was paid by subscribers at the office where the paper was received, the yearly rates on the different editions of *The Iron Age* being as follows: Weekly, 40 cents; Semi-Monthly, 40 cents; Monthly, 24 cents. Under the provisions of the new postal law, which went into effect on the 1st instant, prepayment at the office of mailing is required, at the rate of two cents per pound for the Weekly, and three cents per pound for the Semi-Monthly and Monthly, which will make the postage as follows on the different editions: Weekly, 50 cents; Semi-Monthly, 30 cents; Monthly, 15 cents.

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City Subscribers will confer a favor upon the Publisher, by reporting at this office any delinquency on the part of carriers in delivering *The Iron Age*; also, the loss of any papers for which the carriers are responsible. Our carriers are instructed to deliver papers only to persons authorized to receive them, and not to throw them in hall ways or upon stairs; and it is our desire and intention to enforce this rule in every instance.

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Thirty-fifth Page. —Philadelphia, Buffalo, Cincinnati, Pittsburgh and Detroit Hardware and Metal Prices.
Thirty-seventh Page. —Chicago, Boston, and St. Louis Hardware and Metal Prices.

For the better accommodation of our increasing Philadelphia business, we have opened, under the management of Mr. THOMAS HOBSON, an office at
220 South Fourth Street, Philadelphia.

Southern Iron Manufacture.

We print in another column a letter from Mr. Geo. T. Lewis to Col. S. D. Morgan, of Nashville, Tenn. Its only recommendation to favor is the fact that it is comparatively short. Usually, a communication from Mr. Lewis on the subject of iron manufacture in the South ranges from four to a dozen or more columns. Mr. Lewis will possibly be remembered by some of our readers as the gentleman who, in a discussion with Mr. Edmund C. Pechin, some

years ago, went out after wool and came home shorn. He is also entitled to recognition as the gentleman who has written more of what can be done in Tennessee, and done less to bring about a realization of its magnificent possibilities, than any other person in the South. In the letter to which we give space this week, he undertakes to deny certain calm and disinterested statements made in these columns concerning the condition of cheap iron manufacture in the South, and in doing so evidently forgets what he has already said on the same subject in times past. In Killebrew's *Resources of Tennessee* we find the following estimate by Mr. Lewis of the cost of making iron in that State, on the line of the Memphis, Nashville and Louisville Railway:

Ore, 3½ tons at \$2.....	\$5.00
Coke, 50 bushels at 10c.....	5.00
Limestone, ¼ ton.....	2.50
Labor and superintendence, per ton.....	4.00
Interest on investment.....	.80
Incidentals, per ton.....	1.00
Repairs, etc.....	1.20
Total.....	\$20.25

In the letter elsewhere printed, he revises his estimate, and gives us the cost of making a ton of pig iron at the Cumberland Iron Works, with a furnace of the same capacity as the Lucy, as follows:

Ore, 2 tons at \$1.....	\$2.00
Coke, 70 bushels at 8c.....	5.60
Limestone.....	15
Salaries, etc., same as at Pittsburgh.....	3.25
Total.....	\$11.90
Freight to Pittsburgh.....	5.00
Total at Pittsburgh.....	\$16.90

Now, the resources of Tennessee was first published in the latter part of 1874, and in a little over a year Mr. Lewis finds that Tennessee iron can be made and laid down in Pittsburgh \$4.25 cheaper than it could be made in 1874. We have about reached the conclusion that estimates of the cost of Southern iron are made on the principle of underbidding all competition—on paper. If iron could be made at the Cumberland Works for the price stated by Mr. Lewis, we wonder that when these works were offered for sale under foreclosure of mortgage, there was so little apparent anxiety on the part of iron masters with capital to acquire possession of them, especially as they could probably have been had cheap.

In the articles to which Mr. Lewis takes exception, we stated that there had been a great deal of looseness in the grading of Southern irons. This "reckless assertion" is true in every particular, as every broker who has handled Southern iron knows to his sorrow. All iron men acquainted with Southern brands know that Shelby so long held the lead in prices, simply because the metal was accurately graded. No one ever disputed the good quality of Southern charcoal irons, but it would be idle to deny that, with the same grade of ores in Pennsylvania, worked with charcoal, as at Bellefonte, just as good iron is made as was ever cast in Tennessee or Alabama. But if Mr. Lewis knows anything whatever about iron, he is aware that the red fossil ores or hematites of the South, if worked in a hot blast coke furnace, will not make any such quality of iron. At the same time, they have many valuable uses, and if the prospects of the Southern iron industry are not ruined by extravagant statements, such as Mr. Lewis is very fond of making, capital will slowly flow in and seek investment in mills and furnaces.

Mr. Lewis puts labor, &c., at figures as low for Tennessee as for Pittsburgh. Col. Killebrew, in his excellent book, before quoted, willing to admit that this much favored section has some disadvantages to contend with, says "labor is 25 per cent. higher in Tennessee, and not so efficient." We recommend Mr. Lewis to read the book. He will find in it matters of interest.

Mr. Lewis makes a quotation from Mr. Bell's address, which, if given in Mr. Bell's language—which we doubt—certainly does not convey Mr. Bell's meaning. What he did say was that "the distances which intervene between the coal and ore, and which are more or less conspicuous in many other iron making districts of the United States, are so modified in many parts of Alabama, Georgia, Tennessee and West Virginia, as to place several localities in these provinces in a position of equality with the most favored of those of Europe." But Mr. Lewis is wiser than Mr. Bell, for the latter did not indicate Paducah, lying in the mud at the mouth of the Tennessee, 350 miles from iron ore, as one of the points enjoying exceptional facilities for iron manufacture. Paducah! The name reminds us of Proctor Knott and his speech on Duluth. When the towering stacks of the "Isabella" are covered with moss and ivy; when the snakes chase the lizards among the debris which marks the spot where stood the "Lucy" of historic fame, and when the chimneys of Pittsburgh stand in solitude and gloom, like the columns of Baalbec or of Tadmor in the desert, we may expect to see Paducah the great iron city of the Southwest.

Mr. Lewis thinks it is "too late in the day to discuss the question of cheap production and superior quality of the irons of the South, as compared with Pittsburgh, the North and the world." He may be right, and we wish we were quite sure he thought it time to stop discussing; but probably it is not too late for something of practical importance to be done. The great trouble with the Southern iron trade is that it has too many talkers and too few hard workers content with small profits. We do not hear that Southern capitalists are anxious to put money into furnaces to make coke iron at a price which will enable them to deliver it in Pittsburgh at \$16 per ton. Northern men certainly know better than to make any such foolish ventures. We do hear of some English investments brought about by a gentleman who, however wildly he may have written and talked, can, at least, point to the flourishing village of Rockwood and say: "I did it." But we do not hear of Southern men acting on Mr. Lewis' suggestion in any particular. His glowing statements may have had weight at one time, but the desolate houses around Haynsville, Unaka, Embreeville and Oakdale, attest how valuable such advice as his has been to certain Northern men who read and believed. If coke irons can be made as cheaply as he estimates, why is it that the present Knoxville owners of the Oakdale, who got it for less than a third of its cost, do not put it in blast? Why is it that no one wanted the Cumberland Works last year?

We mean no disrespect to Mr. Lewis, personally, when we say that he and those like him are doing the South vast and permanent injury. Tennessee has great resources, without doubt—greater even than Alabama, for her coal is better and more easily and cheaply worked. But wild exaggeration of these resources will not mislead prudent capitalists. A calm statement of facts, such as Mr. Isaac Lowthian Bell has given us, is worth vastly more than all the froth and foam to which Mr. Lewis has given utterance during the past ten years. We know of many who have turned away disgusted from the actual wealth of Tennessee, because they found that a seam of coal represented as 100 feet thick, was nothing but a fold. We may further add that our Southern friends gain nothing and lose much by their super-sensitiveness to criticism. If their rose-colored statements are not swallowed whole, without question, they have no need to fly into a passion and denounce disinterested statements of facts as "sweeping assertions," "unwarranted assumptions," "reckless misstatements," &c. This kind of talk is cheap, but it is worth nothing. Facts are stubborn things, but they carry weight, which is more than can be said of the glittering generalities and magnificent predictions in which those interested in promoting the Southern iron trade seem to delight. We believe we have considered fairly and intelligently the conditions essential to the successful manufacture of cheap iron in the South, in the articles on this subject lately printed in these columns, and until we have some better reason to change our opinions than Mr. Lewis has given, we shall consider, with him, that so far as we are concerned, further discussion of the question of the cost and quality of Southern pig iron is idle.

Industrial Drawing.

It is only within a very short time that the value of industrial drawing has begun to be appreciated in this country, and even now, when our manufacturers are awaking to its importance, there are a great many of our hardware, stove and architectural iron men who do not seem to fully realize its vital importance to their particular trades. The class of goods most profitable to the manufacturer are those, of course, which give the largest returns for the time and labor bestowed upon them. The best class of workmen are those whose labor confers the greatest possible value upon the manufactured article, in proportion to its cost. Hence, those goods which call for the most skill and taste on the part of the workmen, are those whose value depends least upon the cost of the raw material, and upon which there will be not only the greatest margin for profit, but the least danger of loss.

It is to be remembered that there is scarcely any limit to the value which taste and skill can confer upon a manufactured article, irrespective of the cost of the materials of which it is composed. The cost of the material composing a store door knob or a stove front may be no greater than the average price of fine castings of their respective kinds, and yet the products, by reason of the taste and skill bestowed upon them, may be worth many hundred times the value of the raw material, while the cost of production is but slightly in-

creased over that of the commoner kinds of goods.

The high value conferred upon goods by superior taste and skill, gives them a great advantage over ruder manufactures, not only in the preferences of the consumer, but also in the matter of transportation. A very neat example of this is given by a recent writer. A Geneva watch, which by reason of skill and taste has cost \$250, we will suppose requires \$5 to get it to market. This is but 2 per cent. on the cost. In the case of a \$25 watch there would be the same cost for transportation, yet the transportation would add 20 per cent. to its original cost. We may take the case of a fire grate and fixtures, costing, as some of the fine examples do, \$500, and another of a cheap pattern, costing \$10. Calling the cost of transportation \$5 in each case, one per cent. will be added to the cost in one case and 50 per cent. in the other. An article costly by reason of skill, is lightly burdened by the cost of transportation, and the manufacturer has not only the whole country but the whole world opened for a market. "In a word, it costs but little to transport skill and taste, but much, comparatively, to transport ignorance and raw material." Manufacturers requiring skilled and artistic workmen are very desirable to the community. They attract a better class of population, more money is earned and expended, and there is a greater measure of intelligence than in a community where rough, rude labor is the rule.

While we are striving to reduce the prices of our manufactured articles and widen our markets, we find, as the distances over which we have to pay transportation are increased, that local competition becomes stronger, labor saving machines are exported, and our own skill in manufacturing labor saving machinery is turned against us. While we have done much to decrease the cost of manufactured articles, and produce them abundantly with the least labor, we have been constantly working in the direction of making the cost of the labor and raw material equal to each other. As a nation, we have done but little toward increasing the value of the manufactured article. If a dollar's worth of bronze can be turned into hardware worth five dollars, very well; but how much larger a market would it have if, instead of being worth \$5, the value had been increased to \$50 or \$60, as might have been the case if sufficient taste and skill had been applied. A second-class stove made at the East finds a strong competition at the West from local manufacturers. It has neither excellence nor beauty to give it value enough to stand the heavy freights and local opposition. On the other hand, first-class goods, having a high value and requiring the best skill in all departments of manufacture, can compete in any market in the world. In general, however, our manufacturers are conspicuous for quantity rather than quality. One thing has been proved beyond the possibility of doubt, by the united testimony of European savants, who have a claim to speak with authority on this subject, that is, "If any improvement is to take place in the art industry of a country, it must come from the better education of the people in art, and this must commence with the popular instruction of the people in free hand drawing." It is shown that the knowledge gained at the drawing classes, art galleries and art museums educates men to feel more interest in their work.

Many people, in considering this question of educating mechanics and enlarging the numbers of our industrial artists, assume that we may manufacture too much, that a greater agricultural population is needed, and that we must wait for further growth of the country. Labor-saving machinery is reducing the number of persons needed in agricultural pursuits, so that now in some of our States only one-quarter of the working population is agricultural, while one-third is devoted to mechanics, mining and manufactures. Upon agriculture we cannot depend. Other countries raise more wheat than we do—for example, France, with an area less than that of Texas, raised in 1869 more wheat, by 67,000,000 bushels, than we did in the United States. Our wheat may be a source of wealth, but we had much better feed it out to our mechanics at home and export the product of their labor, than send out of the country the raw material to be consumed or worked up abroad.

To obtain workmen skilled and with cultivated taste, the whole community must be educated in science and art, and especially the latter. Back of the skilled artistic workman, there needs to be a public taste which creates a demand for his productions and stimulates him to greater efforts. A public whose taste is good, furnishes a field from which to recruit workmen of the highest ability. The more fine work produced, the greater the demand

for it, and while fine work always finds a good market abroad, the very best can always command a market at home without seeking it. The prime necessity of industrial progress, is industrial art education. Fortunately for us we have the materials at hand for opening industrial schools. England's experience is before us, and we have already made use of it in founding a large number of such schools. Text books have been prepared and normal schools opened, so that the way is open to any town, private individual or manufacturer wishing to open industrial art schools. In the matter of teaching, the apparatus necessary is easily accessible, and for the primary steps, particularly good in character, comparing favorably with that used abroad. All can learn; few are too old to make progress, and there are none, either old or young, who will not be improved by study of an industrial drawing. The subject is somewhat too large to be exhaustively discussed in a newspaper article, but it is one of great and permanent interest, and we hope the effort now making in New York and one or two other States to make industrial drawing a part of public school education, will be attended with results as important as those already reached in Massachusetts.

The British Iron and Steel Institute and the American Iron and Steel Association.

Recent advices from England report that the British Iron and Steel Institute is about to extend the sphere of its usefulness by adding to its organization an association similar in character and purpose to the American Iron and Steel Association. This supplemental society will collect and tabulate the statistics of the iron trade and conduct all matters connected with the iron business as a branch of trade. It is believed that the membership of the new society or division will largely include the members of the Institute, with, perhaps, a considerable addition of those who may take but limited interest in the papers and discussions of the Institute proper. Thus enlarged, this great and influential society will represent not only all branches, but all phases of the iron and steel trades of Great Britain, and we have no doubt that it will accomplish a great deal of good by a happy combination of the theoretical and practical—technology and business.

In this country the scientific and the practical in matters pertaining to our iron and steel trades are represented by two associations, between which, as societies, there exists but little sympathy. Under the able management of its Secretary and chief executive officer, Mr. Swank, the American Iron and Steel Association renders excellent service in the collection and compilation of iron trade statistics and the care of certain very important trade interests. It has thus far given no attention to technology. The purpose of its organization, we believe, was to make it a scientific body, as well as a trade association; but it has thus far devoted its attention exclusively to matters affecting the business interest of the trade. In the meantime an association has grown up which has gradually extended the sphere of its influence, until it now includes among its membership a very considerable number of intelligent iron masters, scientific iron masters, metallurgists and others, and has gained to some extent the character of an iron trade association. We refer to the American Institute of Mining Engineers. During the past few years this association has done a good work in calling out the views and experiences of our iron masters on many points of interest, and among the papers which have been read before it are not a few valuable contributions to the literature of iron metallurgy. We have always thought, however, that the iron membership of the Institute of Mining Engineers were not working under the conditions most favorable to the creation of a literature as varied and valuable as that which the Iron and Steel Institute in Great Britain, is giving us in its quarterly reports. The interest of the association is divided between iron manufacture and all branches of metallurgy and mining, including gold and silver, and at very many of its meetings matters are discussed and receive a large share of attention, in which the practical iron master has, at most, a secondary interest. Its field is, we think, somewhat too wide to make it entirely successful as a representative of either metallurgy or mine engineering, and while it remains thus general in character, it is not likely to be of as much benefit to science as it would be if its labors were more concentrated.

We have long cherished the hope, and at one time with considerable encouragement, that the Iron and Steel Association would realize the benefit of organizing a scientific section. This was at one time seriously considered, but the panic so disorganized the plans for the enlargement

and improvement of the association that they were abandoned for the time, and have not, so far as we know, been again taken into consideration. It is not too late, however, to make amends for past neglect in this matter, and at the annual meeting of the association this year we hope an effort will be made to carry out the plan of organizing a section for purely scientific work, with active and well selected committees to consider and report upon inventions, improvements and experiments of interest to those engaged in the manufacture of iron and steel. Such an extension of the field of the Iron and Steel Association's labors would greatly strengthen its influence and increase its usefulness, without imposing a tax upon its treasury, as a separate fund could easily be provided to meet all the expenses of committee work. We do not think the Iron and Steel Association could better celebrate the Centennial year upon which we have entered, than by following the good example of the Iron and Steel Institute, and extending the sphere of its labors to include both the scientific and the practical, according to the original plan of its organization.

British Production of Metals from Native Ores.

The official statistics of production from native ores in Great Britain, for 1874, have just been published, and referring to an article we wrote on the same subject about a year ago, when we had before us the details for 1873 and 1872, the three years compare as follows:

1872.				
	Ore Raised.	Value.	Metals Obtained.	Value.
	Tons.		Tons.	
Copper.....	91,983	\$443,738	5,703	\$293,232
Tin.....	14,296	1,246,135	9,560	1,459,990
Lead.....	53,968	1,146,165	60,455	1,309,114
Spelter.....	18,543	73,951	5,191	118,076
Total.....	184,790	\$2,909,939	83,909	\$3,370,412
1873.				
	Ore Raised.	Value.	Metals Obtained.	Value.
	Tons.		Tons.	
Copper.....	80,189	\$242,708	5,240	\$262,822
Tin.....	14,855	1,056,835	9,972	1,329,769
Lead.....	73,501	1,131,907	51,235	1,363,375
Spelter.....	16,402	61,166	4,471	120,099
Total.....	184,947	\$2,522,616	73,918	\$3,216,065
1874.				
	Ore Raised.	Value.	Metals Obtained.	Value.
	Tons.		Tons.	
Copper.....	78,521	\$234,414	4,981	\$247,891
Tin.....	14,039	783,310	9,942	1,077,712
Lead.....	76,202	1,034,107	58,777	1,328,463
Spelter.....	16,830	48,195	4,170	108,773
Total.....	185,592	\$2,197,026	78,170	\$2,930,839

The tables show that the quantities produced have varied but little during the three years. But on comparing the statistics for 1874 with those of 1860, we find a material difference both in the quantities and the price. In 1860 there were 236,696 tons of copper ore sold for £1,507,134, and the average price of best copper was £109 per ton. In 1874 the quantity was only 78,521 tons, the amount £236,414, and the price of copper £89. 12/. The English copper mines in 1860 paid £262,806 in dividends; in 1874 but £11,704. Taking the highest and the lowest price of copper in the period mentioned, 15 years, there is a variation of £37 per ton.

The quantity of the ore sold in 1860 was 10,462 tons, at an average price of £71. 11/6, and the price of tin was £136. In 1874 the quantity was 14,039 tons, but the average price of the ore was only £56. 3/, and of the metal £108. 8/. In the fifteen years the quantity in the former was £39, and in the latter £64 per ton. In 1860 the dividends paid by tin mines were £65,226, and in 1874 only £32,120.

The returns of lead ore show that in 1860 the quantity was 89,081 tons, and the average price of ore £13. 17/8, and of pig lead £22. 6/3 per ton. In 1874 the quantity was 76,202 tons. Ore averaged £14. 13/, and pig lead £22. 2/. In the 15 years the variation in the former was £3. 6/4, and in the latter £5. 4/ per ton. In 1860 the public lead mining companies paid £70,826 in dividends; in 1874, £22,811; and during the first 10 months of 1875, £27,620. To these have to be added the profits of the private lead mining companies, which may fairly be taken at an additional sum of at least £150,000, making upward of £250,000 of annual profit yielded by British lead mines, even under disadvantages.

In the last few years great improvements have been introduced into the mode of dressing lead ores in England, which have not only enabled them to be brought up to a higher percentage, but more of the metal is also extracted from the matrix. The cost has been further reduced, while the yield has been increased from the same quantity and quality of ore.

Of public lead mining companies there are in England eighteen, with a paid up capital of £669,234. They have paid in dividends since they were incorporated the large amount of £1,702,932, and their market value at the present day amounts to £1,403,453.

The conclusion to be drawn from these statistics is that copper mining in England is rapidly on the decline, and that tin mining, at present prices for the metal, is not profitable, the principal reason

why last year it has been curtailed. As for lead mining it is as flourishing as ever, and seems to have a most promising future ahead, the more so as outside of the United States there is no over production at present, and every indication of an increased consumption.

We are continually receiving good advice from our English neighbors in matters pertaining to our industrial welfare. A gentleman in this country lately received a letter from one of the largest calico printers in England, in which we find the following: "If you could abolish the import duty I think the cloth would soon begin to move to your country, and your countrymen would find better employment than in a close, unhealthy factory." We have often thought that the interest manifested by English manufacturers in the abolition of the tariff was attributable to selfish considerations only, but in this we have evidence of a philanthropy so broad that it is willing to see the English working classes suffer in "close unhealthy factories," working to supply us with cotton cloths, that our work people may be emancipated from toil so injurious and left free to enjoy the pastoral pleasures of agriculture and raise breadstuffs for the English market. Such disinterestedness is beyond our expectation. It touches our tenderest sensibilities and brings the unbidden tear to the eye. Who will now say that England and America are not bound together by closer ties than those of political union, and that the great warm English breast does not beat responsive to the appeals of the American workingman to be freed from the disagreeable necessities of working in dark and dusty factories, and left free to follow the seductive plow or wield the persuasive scythe in the warm and charming sunshine—for \$16 a month during the summer, and sumptuous apartments in the hay mow. During the winter they could chop wood for recreation, if they could get it to do; if not, they could wrap themselves in English cottons and walk about enjoying the bracing air and communing with nature. It is evident that this would be far better and more wholesome than working in "a close unhealthy factory" for current wages, and the man who would not seize with avidity the opportunity of thus bettering his condition, must be one of the class who, in the opinion of certain eminent writers on political economy, do not know their daily bread when they see it.

Southern Iron.

We are requested to publish the following: CUMBERLAND IRON MILLS, Dec. 27, 1875. Col. S. D. Morgan, Nashville, Tenn.—DEAR SIR: Your esteemed favor, and the *Mining and Manufacturers' Journal*, of Tracy City, are just at hand. The editorial of *The Iron Age*, of New York, copied by the *Journal*, says: "We do not doubt that iron is made in Tennessee cheaper than in Pennsylvania, but by the time it is delivered in Pittsburgh the added cost of transportation makes it cost more than the local product."

It was stated in an editorial of the *American Manufacturer and Iron World*, published, edited and owned in Pittsburgh, that the cost of making a ton of pig metal in that city in November, 1874, was as follows:

Ore, per ton of metal.....	\$15.37
Coke, per ton of metal.....	4.35
Limestone, per ton of metal.....	2.05
Salaries and labor, per ton of metal.....	2.25
Repairs, per ton of metal.....	1.00
Total.....	\$25.02

I take it for granted that the worthy editor quoted the cost of best pig, made at the best furnace, the "Lucy."

The cost of making a ton of pig metal here—the Cumberland Iron Works—with a furnace of same capacity as the "Lucy," and transportation to Pittsburgh, would be as follows:

2 tons ore, analysis by Britton, 59.22 pure metallic iron.....	\$ 2.00
70 bushels of coke—these ores are not so refractory as Lake Superior ores—at St. Louis.....	\$ 5.60
Limestone, per ton of metal.....	15
Salaries, labor and repairs same as Pittsburgh per ton.....	\$ 2.25
Transportation to Pittsburgh per ton of 2265 lbs.....	5.00
Total.....	\$16.00

Showing a difference in favor of Tennessee as Pittsburgh of \$9.02 per ton, a fair profit, surely, on a product of 30,000 tons a year. "Again," said *The Iron Age*, "there has been a great deal of looseness in the grading of Southern irons, which has not tended to give them a good name, or to enable the makers, as the rule, to command a high price for them."

In answer to this reckless assertion, I merely quote what an iron manufacturer of Pittsburgh stated in a letter from Chattanooga, dated June 16, 1870, and addressed to the editor of the *Pittsburgh Review*: "The iron from Alabama and Tennessee has brought in Philadelphia sixty-three (63) dollars a ton, and gave character and tone to high priced Northern iron that the Northern iron of itself did not possess." Not "a great deal of looseness in the grading of Southern irons," in the opinion of that correspondent.

Again, said he, "I saw Tennessee and Alabama pig iron made into wrought iron by no other 'physic' than the puddler's brawn and brain, and which, if broken or cut, and guessed at unknown from the company of Lowmoor and Swedish, would at once have the finger of preference laid on it." Very high

"grading" this, if "loose," that places Alabama and Tennessee iron superior to Swedish by an iron maker of Pittsburgh.

The editorial of *The Iron Age* says further: "We give the comparison of cost of making a ton of pig metal at the Lucy Furnace at Pittsburgh, and at the Rising Fawn Furnace, in Dade county, Georgia:

	Lucy Furnace.	Rising Fawn Furnace.
Cost of ore.....	\$11.25	\$5.00
Cost of 80 bush. coke.....	3.80	8.00
Total.....	\$15.05	\$13.00

A complete refutation of the above erroneous statement is in an editorial of the *American Manufacturer and Iron World*, of 16th inst., which says: "Regarding the Lucy Furnace the above is full of errors. The ore used at the Lucy has cost this season delivered at the furnace \$10 a ton, which would make the ore for a ton of pig cost \$15."*

You will remember, sir, that I have often said to you that the South—Kentucky, Tennessee, Alabama and Georgia—could make iron, ship it to Pittsburgh, sell it at the cost of production there and realize a fair profit; and, sir, that assertion is an incontrovertible truth. Metal can be made here, as you see from my figures, at very low cost, and in great quantity.

The Bellwood Furnace ore banks, as analyzed by Britton, shows 58.37 per cent. of pure metallic iron; the Dove Furnace ore banks, as analyzed by the same intelligent chemist, produced 57.84 per cent. of pure metallic iron, and the Bear Spring Furnace ore banks, as before stated, 59.22 per cent. of pure metallic iron, and either of these furnace banks have ore sufficient to supply a dozen Lucy furnaces, for a century, and the La Grange iron property, adjoining this, is equally favored with ore, as is the Brown'sport and other furnaces on this and the Tennessee River near by. It is proper to say, Colonel, that there are locations in this State, Alabama and Georgia, where metal can be made with coke as a fuel at a lower cost than here.

Mr. Lowthian Bell, the great iron man of the world, stated, on his return from a visit to the United States, in an address to the British Iron and Steel Institute, that "Tennessee, Alabama and Georgia could produce iron at a little over half the cost in the North—Pennsylvania—and as cheap as the most favored localities in Great Britain." These truths should have been pondered over by the editor of *The Iron Age* before he permitted himself to make such unwarranted statements. He seems to think all the iron of the South must go to Pittsburgh to find a market, and ignores St. Louis, Louisville, Cincinnati and other markets equal to Pittsburgh for Southern Iron. You, sir, are familiar with the advantageous position of Chattanooga as an iron city. Have you ever let your mind dwell upon Paducah as the most advantageously located city in all the land for the manufacture of iron and steel in all of their varieties? She is within one dollar a ton of the pig iron of Tennessee, Alabama and Kentucky, and at the very gateway of the Warrior coal field of Alabama and the coal field of Western Kentucky and Indiana. Before another decade shall have passed, that city, so located that the iron and coal of the Tennessee, Ohio and Cumberland rivers can be floated down the current to it, will attract the attention of capitalists from abroad. Within three hundred and fifty miles of that city, two hundred and sixty-three miles of which is reliable water transportation, there are immense deposits of iron ores of superior quality, easily reduced, analyzing 58 per cent. of pure metallic iron, and stone coal inexhaustible in quantity, analyzing 66 per cent. of fixed carbon. These two iron cities of the South have natural advantages pre-eminent to those of Pittsburgh, or any locality in the United States. They are in the lap of what will be home markets, and will reach the seaboard and foreign markets at a nominal cost. It is too late in the day, Colonel, to discuss the question of cheap production and superior quality of the irons of the South, as compared with Pittsburgh, the North and the world. Nature decided that long since. Men began to realize the fact forty six years ago, when these works commenced to ship pig iron to Pittsburgh, which has been kept up with slight intermission to this hour, and now it is conceded by the intelligence of the iron world, except a few doubting savans who will not believe any good thing can come out of this favored land.

Yours, truly,

GEO. T. LEWIS.

Metallurgical Technology.

The following interesting items in relation to the technology of iron, are from the report of David Forbes, F. R. S., to the Iron and Steel Institute, and published in the *Journal* of the Institute:

Magnetism of Iron.—In has generally been accepted that iron at a red heat was incapable of being rendered magnetic, and this was sustained by Elias, in *Poggendorff's Annals* for 1872; the reverse of this is now, however, maintained by M. Ganguin, in a communication to the Academy of Sciences, in Paris, February 1st, who states that if it is wished to saturate a bar of iron with magnetism, the best method of doing so is to magnetize it whilst its temperature is very elevated.

Magnetism of Steel.—Commandant Treve has communicated to the Académie des Sciences the results of experiments made by himself and M. Durassier, the head of the chemical department at the Creusot works, on the connection which exists between the nature of steel and its magnetic force. Fifteen bars of

* *The American Manufacturer* of Dec. 23d, states that the ore used by the Pittsburgh furnaces have the same figures of cost. Our figures of the cost of the ore used at the Lucy were obtained from the gentleman who holds the contract to furnish it, while our figures of the cost and consumption of coke in that furnace were given to a correspondent of *The Iron Age* by the proprietors of the Lucy—Editor of *The Iron Age*.

steel were selected, which were divided into five sets, each of which received a different temper, after which M. Treve magnetized them to saturation, and then determined their magnetic force by the method of deviation. Those bars which contained 0.250 per cent. of carbon, and which were hardened in cold water, gave a maximum of deviation represented by the number 47; whilst a bar with the same amount of carbon, but hardened in boiling water, gave the number 44; and a third bar, also with the same amount of carbon, but hardened in oil of a temperature of 10° Centigrade (50° Fahrenheit) only gave 43, showing that the fluid used in hardening exerts an influence. The effect of the amount of carbon contained in the steel is also established, for whilst the maximum of deviation of the above mentioned bars, which contained 0.250 per cent. of carbon, was found to be 47, other bars containing 0.250 per cent. of carbon only showed a deviation of 13. In laying down the curves of variation, the influence of the amount of the carbon and of the hardening media was sensible enough, but the effect of the latter was smaller in proportion as the former increased, and M. Treve has ascertained the fact that the magnetic curve of a steel bar coincides with its curve of elasticity, thus proving that carbon not only gives to steel its elasticity but also its magnetic capacity.

Magnetic Separation of Iron and Steel.—Some time ago we called attention to certain machines which were employed on the river St. Lawrence, in Canada, for concentrating by means of magnetism the ferruginous sands so abundant in those parts, and in which the iron existed in the state of the native magnetic oxide of this metal; we now call attention to a somewhat similar arrangement called a magneto-mechanical separator, which has for its object the separation of iron and steel filings from the copper, brass and other filings, which accumulate in the workshops. The machine is the invention of Mr. Charles Vavin, and was described by M. Bouillet at the meeting on the 1st May of the Société d'Encouragement des Arts, &c. We must refer to the original source for details, but it may be mentioned that the mixed filings fall on two cylinders placed one above the other, and furnished with rings of soft iron, which are rendered magnetic by strong artificial horse shoe magnets of iron, placed as radii. Effective arrangements are made in order to render active the entire surface of the cylinders, and a brush of pig's bristles detaches the adherent filings. It is stated that the separation proceeds very well, and that a machine not costing more than £90 is capable of cleaning half a ton of filings per day. Judging from the description, however, we should be inclined to give preference to the machine used at Quebec, which has already been noticed in a former report.

Reducing Iron Ores with Lignite.—The importance of the question as to the possibility of smelting iron ores economically, by means of the geologically speaking, younger carboniferous deposits, such as the brown coals and lignites (which, in many parts of the world otherwise altogether deficient in true coal, as we are accustomed to call the mineral of carboniferous age, are found as immense deposits), is probably not fully appreciated in this country, where we are so abundantly supplied with the real article, yet it is a question which is attracting more and more attention on the Continent. Under the head of Greece, we have briefly alluded to some trials made in order to smelt the Seriphos brown hematites with the tertiary lignites of Kroumi, which experiments cost a large sum of money and turned out a complete failure, but attempts to use a mixture of lignites with the coke in the blast furnace appear, recently, to have been, at least in some instances, more successful; thus we find in the *Kœruthen Zeitschr.* for 1875, p. 135, an account given by E. Heygrowsky of trials made at the Zeitzweig blast furnaces, which proved that it was possible to replace up to 40 per cent. of the cokes by raw brown coal from Fohnsdorf, with the result that the Bessemer pig produced in the furnace was not only about 10/ per ton cheaper, but also was somewhat purer than when made with the cokes alone, the author considering that when using lignite it is very important to have a wider furnace with a strong and highly heated blast; much more tar is, however, deposited in the gas tubes, which require to be so arranged that they can easily be cleaned out.

We also learn from the *Oesterr. Zeitschr. für Bergb.*, 1875, a. 130, that some experiments have lately been made at the Proevah Iron Works, in order to smelt the Huettener brown hematite, in a Siemens rotary furnace, with lignite, but the result was altogether unsatisfactory in an economic point of view, the product being in part useless, full of slag and not by any means uniform. Trials made by adding to the charge of the coke blast furnace as much as 33 per cent. of the lignite from Lieschaer, appeared, however, to work tolerably well.

In the *Berg und Huettenmaennische Zeitung* for last year, No. 24, will be found a communication treating more at length upon the same subject by R. Von Reichenbach, in which, after giving a summary of the experiments and proposals already made by Gerdorff, Wagner, Mietsch, Khern, Siemens and others, he suggests that further trials should be made on the following plans: (1) with the older lignites, by employing a comparatively low blast furnace with an extremely hot blast to prevent the coal sintering; (2) with the more recent lignites, by first drying them so as to expel all moisture and chemically combined water, and use them as above; (3) by further attempts at coking the lignites; (4) in cases where there are large quantities of very small coal, to use this for the reduction of the ore in one furnace or part of a furnace, and afterward smelt it by the coarse coal; (5) and lastly,

to smelt the iron ores by the gases produced from the lignites in generators.

Still more recently our attention has been directed to the *Berg und Huettenmaennische Zeitung* for the 11th June this year, in which M. A. Kerperly communicates a description of a furnace recently patented by L. Nessel, of the Friedrich's Furnaces, at Rokitzan, in Bohemia, for smelting iron with brown coal or lignite.

Manganiferous and Phosphoric Pig Iron.—An exhaustive paper, by M. H. Le Chatelier, has appeared in the *Annales des Mines*, vol. 6, p. 216-244, for 1874, entitled "Notes taken during a tour in Belgium, on the manufacture of cast iron, containing manganese and phosphorus at the same time, and on their employment in the manufacture of fine-grained wrought iron." The production of good wrought iron at the works of Ougree, Grivegnée, Dolhain and l'Esperance, in Belgium, in iron ores containing from one to two per cent. of phosphorus, which amount is afterward in great measure expelled in the operation of puddling and the part played by manganese in this operation, has been carefully studied by M. Le Chatelier, whose experiences are given at some length, and whose paper is well worth perusal by all interested in the subject.

Natural Gas as Fuel.—The success attendant upon the employment of the natural gas from borholes in several parts of Pennsylvania, as has been alluded to in previous reports, has encouraged a large number of trials being made to extend its application. At Apollo, the whole of the heating furnaces and steam boilers of the iron works are now kept supplied with natural gas from a well sunk to the depth of 1250 feet in search of it, and it is said that a combination of iron masters, consisting of Messrs. Lewis, Bailey, Dalzell & Co., Spang, Chalfant & Co., and Graff, Bennett & Co., have acquired the Butler gas well, and are about to convey the gas in pipes, the distance of some 20 miles, in order to use it at their iron works. In March, Messrs. Spang, Chalfant & Co. were still boring for gas in their works at Pittsburgh, as also were Messrs. Reis, Brown & Berger, of Newcastle, who had already got down some 1500 feet. In Ohio, also, the Niles Iron Company were putting down a gas well, as they are called, at their rolling mills at Niles, but the attempt made at the Leetonia Iron Works had been abandoned after getting down 1500 feet.

Mechanical Puddling.—A communication by Dr. Durre, of Aix la Chapelle, relative to the advances made in mechanical puddling with special reference to the use of the Pernot furnace, illustrated by drawings of the furnace of Pernot, Spencer and Howson and Thomas, has appeared recently in the *Zeitschrift der Vereines deutscher Ingenieure*. After a short review of the results obtained up to the date in the furnaces of Danks, Sellers, Crampton, Howson & Thomas, Spencer & Pernot, the author expresses himself in favor of the last named furnace, principally for the reasons that the mechanical motion is more favorable to the work itself, and the furnace bed is more easily fitted and accessible during the operations, whereby the production of smaller blooms can be more easily managed.

Ehrenwerth's Rotary Puddling Furnace.—The *Bulletin du Musée de l'Industrie* contains a description of this furnace, from which the following is abstracted: It consists of a revolving hearth fixed on a vertical shaft, and formed of a cast iron bottom and a flange plate. The entrance of air to the furnace is prevented by a cylinder of sheet iron fixed to the hearth or flange plate, and dipping into an annular trough in which water continually circulates. The mode of cooling the sides of the furnace differs according as this cylinder is fixed to the hearth or flange plate; in the former instance, the sides being hollow, the cold water is led under pressure in pipes to the hollows, and the flow takes place in the trough above the lower edge; while in the latter case the water is forced against the sides of the hearth in small jets crossing one another, and then runs into the trough. Motion is communicated to the hearth shaft by means of a pair of cog wheels driven by a belt from the main shaft.

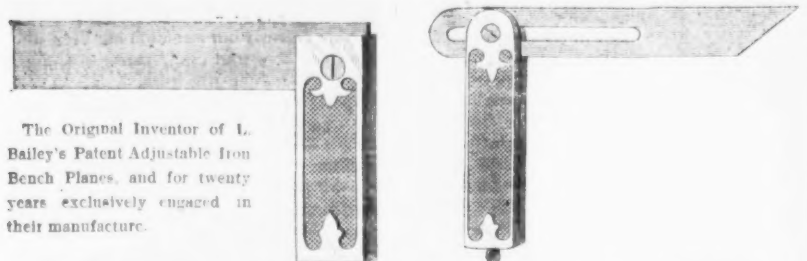
The heating of the furnace may be by an ordinary fire grate or by gas, and when it is charged, the hearth is put in motion at the rate of 20 to 24 revolutions per minute, and as soon as the pig begins to melt it is worked about with rables provided with peels placed obliquely. These rables, which have a notch so as to rest on cones in the furnace doors, are moved from the edge of the furnace to the center and back again, either by hand or by engine power. By placing these peels at two contrary angles, one works the iron which is being puddled toward the interior of the furnace, and the other toward the exterior, so that, by the combination of these movements, with the rotation of the hearth itself, the molten metal is kept in continual agitation.

The balls are made by the puddler as usual, the hearth being only made to revolve from time to time, when one ball is ready, so as to place a fresh quantity of metal before the working door. In order to bring the balls to as uniform a temperature as possible, the hearth is again rotated, the balls returned, and taken out and shingled as usual. The slag in the furnace is then tapped out through two inclined holes left in the flange plate, or it may be ladled out.

One furnace, having two working doors, into which from 15 to 20 tons pig iron are charged at a time, requires four puddlers to work it, or three puddlers and a stoker, if the metal is worked by engine power.

(To be continued.)

We learn from the *Lehigh Register*, of Allentown, that the Lehigh Valley Iron Company, at Coplay, made 1000½ tons of pig iron last month from one stack, 864 tons of this being No. 1 and the balance No. 2. We also learn that the company now has no iron on hand, and is selling as fast as manufactured.



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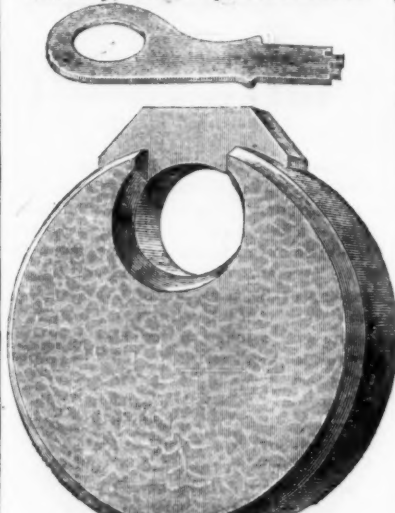
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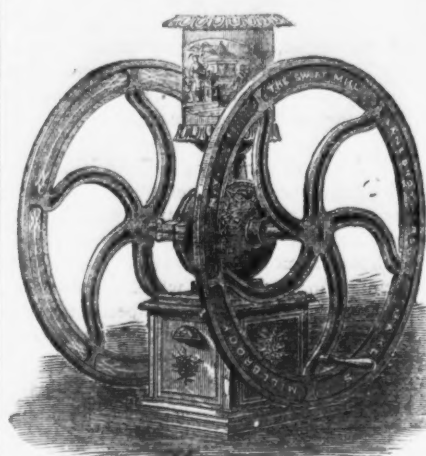
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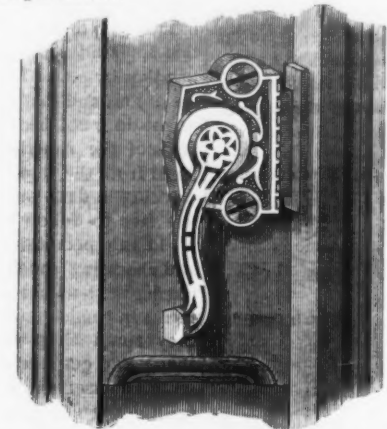
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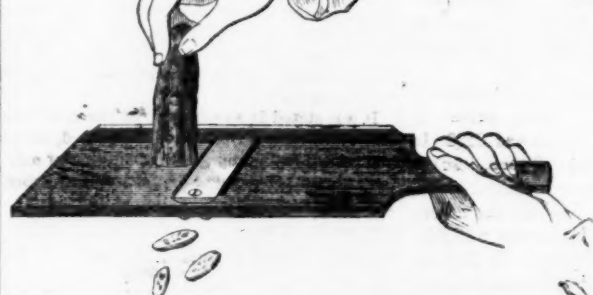
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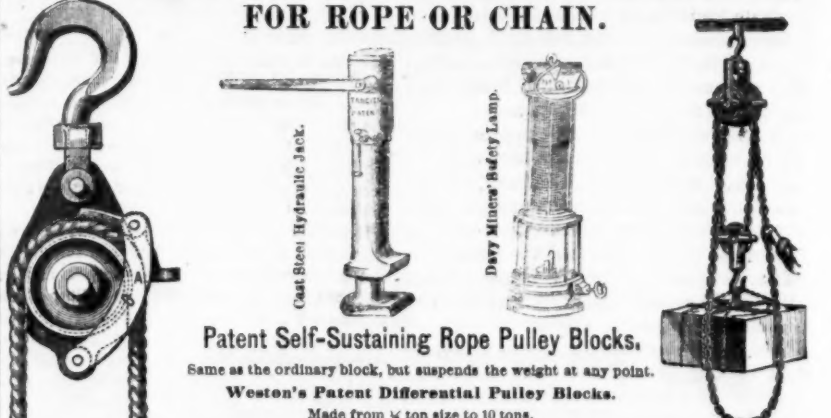


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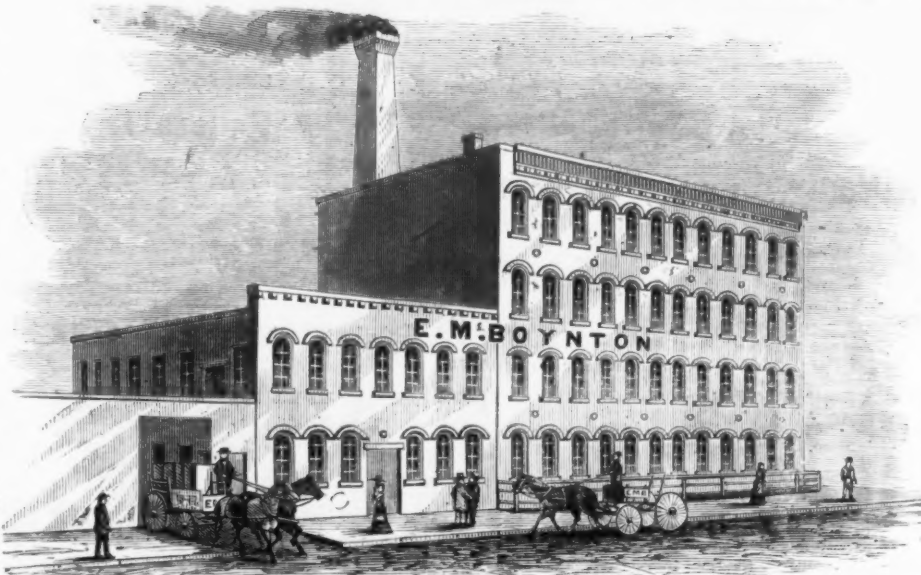
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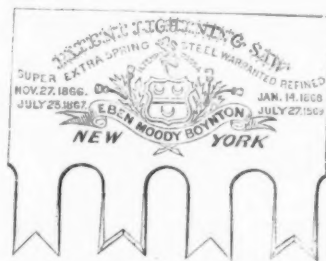
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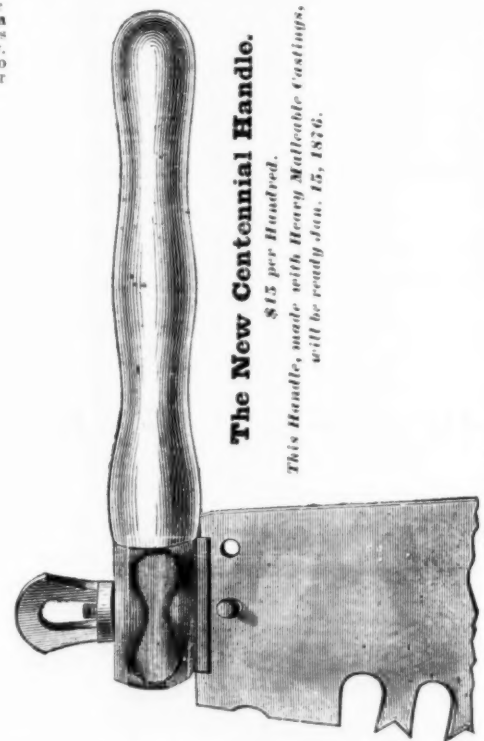
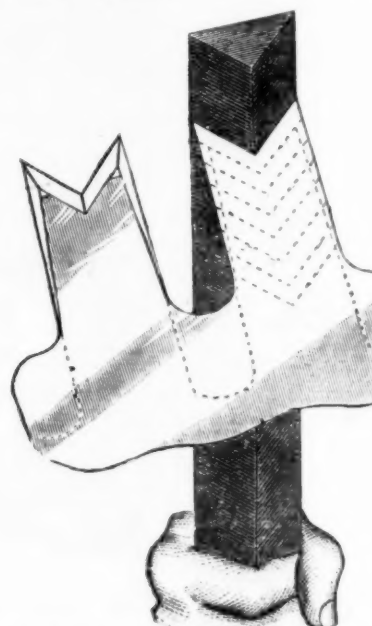
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Price, per dozen, \$8.40 net; sample sent by mail to dealers on receipt of \$1.00.

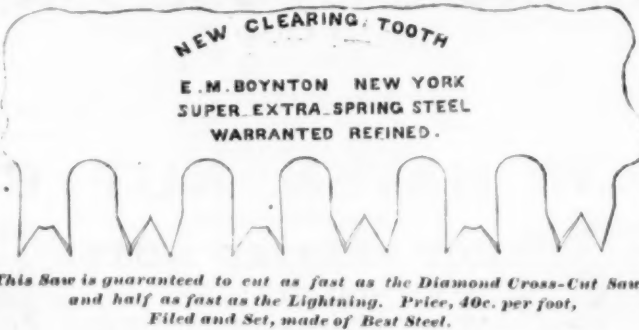
My genuine Patent Lightning Saws still lead the American market, and are shipped abroad extensively. No manufacturer dares question this or submit his saws to a public test trial. I offer \$500 for expenses. My efforts within a few years have trebled the sale of Cross Cut Saws. While I have prospered, the public have been educated in scientific timber cutting—no small thing when it is asserted that a Billion Dollars is the annual Wood, Lumber and Timber crop of America—four times the value of our wheat crop. The immense waste in cutting wood with axes is almost incredible; any one engaged in cutting cord wood will tell you that the tough and knotty timber and chips are wasted, when they may be come cord stove wood, if the logs are cut short with my cross-cut, as blocks of one foot in length are easily hauled and split. The savings of timber and time by the scientific use of saws, it is computed, would equal the annual interest on the U. S. public debt *reversed*, and the toil of millions of farmers be lightened, if they will only learn to use saws. Every clearing tooth saw has no other cutting teeth but the old V, and is, therefore, necessarily inferior. It has, however, an M shape clearer, and if the speed is due to one M in three teeth, why not treble the improvement by using all M teeth? A Champion Raker M does no cutting, but to prevent its clearers catching, it is kept 1-16 inch short, six average cuts of 1-100 inch short, and therefore its only mission is to remove dust that may be choking up the arches. As a shovel it is useful; but my Lightning plow teeth, all of even length, require no shorting or gauge, clear as they cut simultaneously, which is better than the old process of wearing off timber. This is why no manufacturer ever has dared test publicly against my Lightning Saw, which was awarded the highest Silver Medal over all competitors at last American Institute Fair, the same as usual.

The teeth of an ordinary cross-cut saw are usually one inch apart. If an ordinary log saw has fifty teeth employed in cutting a log, and if a progress of 1/4 inch each motion is obtained, the cutting of each point would be 1-20 of 1/4 inch, or 1-80 of an inch, the thickness of a very thin sheet of paper. If we slow a cut of double the amount, still but a hundredth of an inch is used. Now, by filing out the middle of my tooth, thus  it is evident the shortening of an average M filing will reach up to the undulled edge, which will require but slight edging, thus saving the shape perfectly, and *containing a square inch instead of the point of steel of other saws, or three the durability, without gumming, thus saving files, time and money.*

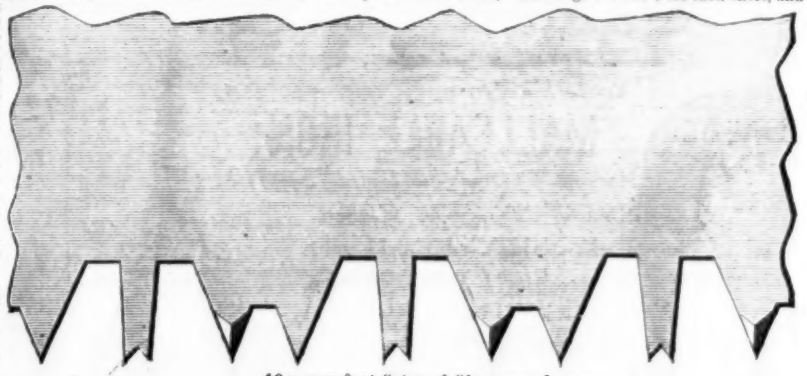


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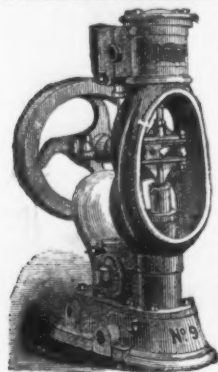
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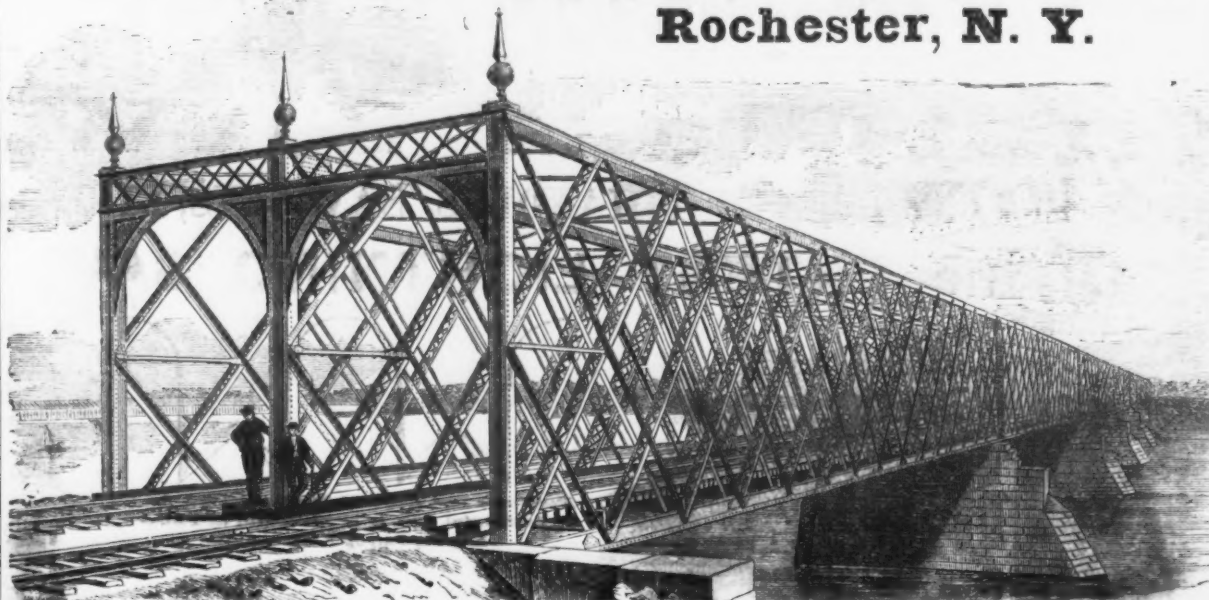
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and Contractors.

[Accompanying engraving represents the Spring-
field Bridge, built by the Leighton
Bridge and Iron Works.]



SPRING PERCH CO., Bridgeport, Conn.

Established 1843. Manufacturers of FIRST QUALITY

SPRINGS & AXLES

And Beer's Patent Curtain Rollers, Concentric Hinges, Etc., Springs of any pattern made to order. Send for Circular and Price List.

V. G. HUNDLEY.

79 Reade Street, New York. Agent for



North Carolina Handle Co.,

(WILSON & SHOBER, Proprietors.)

Manufacturers of SPOKES, AXE, PICK, SLEDGE, HAMMER, HATCHET, and other
Handles. Full assortment always on hand.

JOHN CRANE, Agent, 103 Chambers St., N. Y.

GREENSBORO' HANDLE WORKS.



Manufacturers of SPOKES and CARRIAGE WOOD WORK, AXE,
PICK, German and American SLEDGE and other Handles.

Send for Catalogue and Price List.

THE BEST FARM BELLS.

Superior in tone and finish. Cast from
the pure Crystal Metal. Satisfaction guar-
anteed. Lowest in price.

Circulars and price list free to the trade.



C. S. BELL,

HILLSBORO', OHIO.

HAMMER & CO.,

Branford, Conn.

Manufacturers of the following Patented Articles of

MALLEABLE IRON:

Hammer's Adjustable Clamps.
Hammer's Malleable Iron Oilers.
Hammer's Mail Iron Hand Lamps.
Hammer's M. I. Hanging Lamps.

For Sale by all the principal Hardware Dealers.

Malleable Iron Castings

Superior Quality made to order.



HISCOX FILE MANUFACTURING CO.

WEST CHELMSFORD, MASS.

FILES & RASPS

OF EVERY DESCRIPTION, ALSO ALL KINDS OF

MACHINE → → → RAG
MOULDING → → → STRAW
VENEERING → → → PAPER OR
LOG WOOD → → → TRIMMING

KNIVES

HISCOX FILE MANUFACTURING CO
WEST CHELMSFORD, MASS.

GOTHIC STAR CHAIN WORKS,

WHITAKER & SKIRM,

Manufacturers of

CHAINS and Chute Nails,

TRENTON, N. J.



Furnace

FOR HEATING
Houses, Schools,
and Churches.

Combines many improvements in Working: Econom-
my, Durability, Power, Freedom from Gas.
See for Catalogue.

ALEX. M. LESLEY, Manufacturer,
226 West 23d Street, N. Y.



The Sugar Maker's Friend.

More agents
wanted to
carry for the
sale of Post's
Patent
Galva-
nized Metallic
Hangers. Sam-
ples, Circulars and Terms sent on re-
ceipt of 20¢ in pay postage. Address:
C. C. Post, Manufacturer & Patentee, Burlington, Vt.

Cell Chain.
Taper Chain.
Bent Chain.
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Car Brake and Safety Chain.
Made to any specified length.
Special attention given to
Chain for Agricultural Ma-
chines.

Rake Chain.
Reel Chain.
Drill Chain.
Stay Chain.
Lock Chain, &c., &c.

NEW HAVEN NUT CO.,

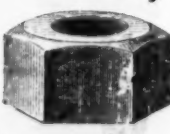
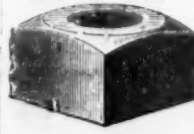
MANUFACTURERS OF

HOT PRESSED NUTS

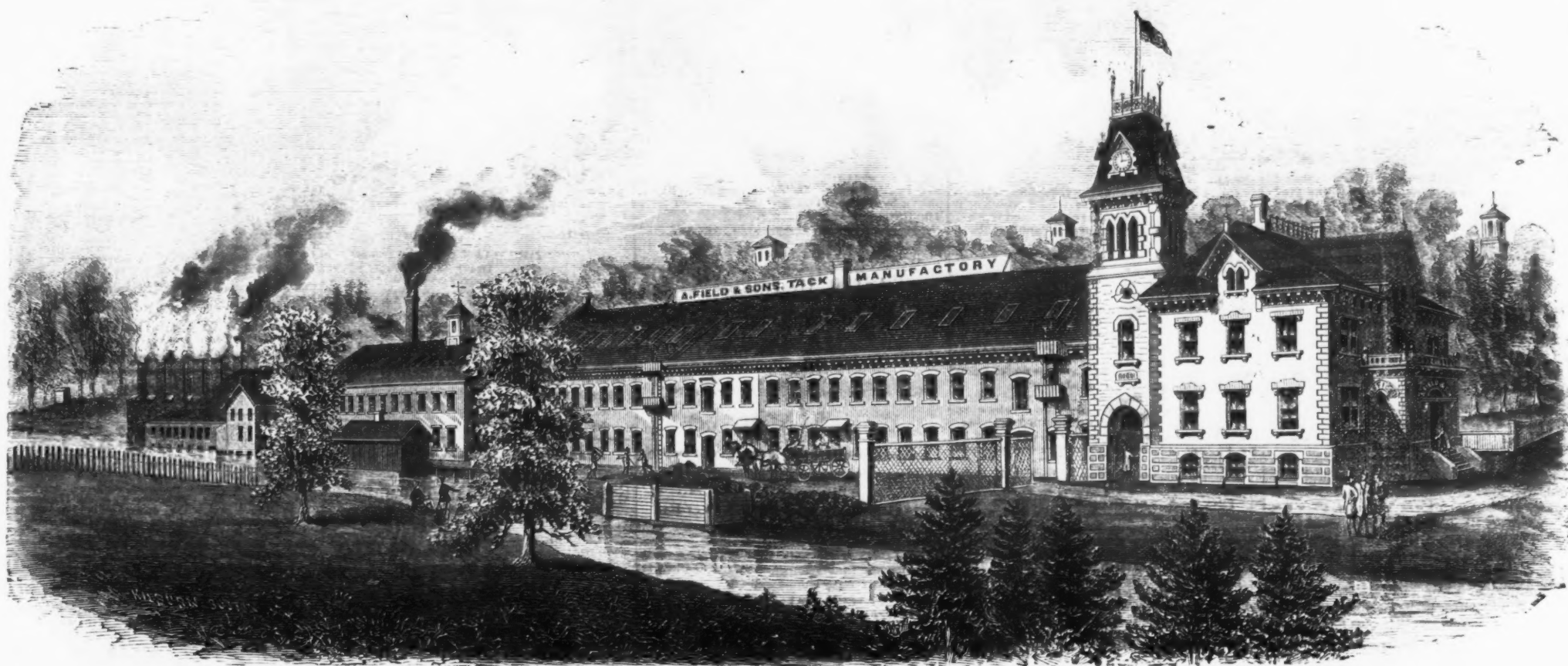
Of Superior Quality of all sizes, both
HEXAGON & SQUARE,

From 1/4 inch to and including 1 1/2 inch B. L.

Factory and Office. WESTVILLE, CONN.



ESTABLISHED 1827.



ENTIRE LENGTH OF WORKS, 700 FEET.

A. FIELD & SONS,

TAUNTON, MASS.

Manufacturers of

TACKS

NAILS

BRADS AND PATENT BRADS.

IRON
COPPER
TINNED
SWEDES IRON
UPHOLSTERERS'
CARD CLOTHING
PAIL AND TUB
GIMP
LACE
PATENT COPPER PLATED
LARGE HEAD CARPET,

FINISHING
TRUNK
CLOUT
CHAIR
CIGAR BOX
HUNGARIAN
HOB
SILVERED OR JAPANNED LINING
SILVERED OR JAPANNED SADDLE
TUFTING
COPPER CUT

LEATHERED CARPET
TINNED CARPET
COLORED COATED CARPET
COFFIN LINING
MINERS'
BRUSH
LOOKING GLASS
SHOE OR LASTING
ROUND HEAD
ROOFING
EVERY STYLE OF

BOAT REGULAR
BOAT CHISEL POINTED
FINE TWO PENNY
FINE THREE PENNY
PATENT COPPER PLATED
CHANNEL
AMERICAN IRON SHOE
SWEDES IRON SHOE
ZINC SHOE
STEEL SHOE
CHARCOAL IRON SHOE

With New, Improved, and Patented Machinery, we shall now make

GLAZIERS' POINTS,

ONE OF OUR SPECIALTIES.

Any variation from the regular size or shape of the above named goods made from samples to order.

QUALITY GUARANTEED TO BE SATISFACTORY.

OFFICES AND FACTORIES. - - - - - TAUNTON, MASS.

Warehouse and Salesroom at 78 Chambers Street, New York.

BUSINESS ITEMS.

NEW YORK.

The Rensselaer Iron Works, of Troy, resumed work at the puddling furnaces on Monday night, 30th ult., giving employment to about 250 puddlers, who have been idle since August last. The puddling works will continue for two or three weeks at least, and perhaps all winter. The puddlers voluntarily reduced the wages to meet the exigency of the times. The wages have been fixed at \$3.25 per ton. It is thought that all the company's mills will soon be at work.

MASSACHUSETTS.

Sager Ashworth & Co., Lowell, are employing 15 men making hand-cut files and rasps.

They have commenced manufacturing at the new Warner File Mill, Holyoke.

The Ames Company, Chicopee, have temporarily suspended work on the Turkish contract, on account of the embarrassments of the Providence Tool Company, who sub-let the job to the Ames Company.

Running time has been reduced to eight hours per day by the Whitin Machine Company, Whitinsville.

The Old Colony Iron Company, of Taunton, shut down a part of their works week before last, throwing about 300 men out of employment.

NEW HAMPSHIRE.

Since their establishment in 1869 the Crescent Axe Company, Manchester, have turned out 25,000 axes. Two-thirds of their present production are the "Crescent" axes. The axes of this company are all made by Reynolds's patent improved hammer dies, for condensing the steel, thereby giving them great strength and a superior cutting edge, at the same time compelling the workmen to make them all alike. The company are now running their usual number of hands on full time. Their production for the year shows an increase over last season of 10 or 15 per cent.

S. C. Forsyth & Co., Manchester, manufacturers of printer's machinery, will have some of their machines on exhibition at the Centennial; among them the "Abbe" patent bolt forging machine, Palmer's patent power spring hammers, and newspaper folding machines. This firm also manufacture circular saw mills with patent set works, upright bolt shingle machines, etc. They have lately shipped one of their bolt heading machines to Moscow, Russia.

RHODE ISLAND.

The American Butt Company, Providence, are busy just now increasing their capacity for work. They have put in four 30 inch cylinder boilers to replace three 32x30 ones, and have contracted for a 100 horse-power engine to substitute for their present old fashioned one of 50 horse-power. They make all kinds of builders' hardware, including butts, of which they sold in 1874 100,000 dozen. Their yearly sales average net about \$130,000. Their buildings are all brick, covering about 4 acres of ground on Broad street. They have two foundries, one 40x112 and the other 50x50. Their finishing shop is 50x100, in addition to which they have machine shops, japan shops, &c. They are doing a large business in pipe castings for steam and gas pipe, casting fine work to order.

The American Diamond Rock Boring Company, of Providence, are shipping \$50,000 worth of their drills to the German government, and also filling orders from Sweden and Chili. The company lately finished the job of taking a 24 inch core out of the columns of the State Capitol at Columbus, Ohio, the immense pillars in their solid state being considered too heavy for the foundations. They are also running one of their boring machines at the Silver Islet Company's mine, Lake Superior, taking out a core 1 1/2 inches in diameter, having already gone 500 feet, and are to go 600 further. The Reading Coal and Iron Company are using these boring machines to sink two shafts 1500 feet, making progress of 100 feet a month. While timbering, blasting, and cleaning one shaft the other is being bored, and so alternately. Their prospecting drills are being extensively used in all parts of this country and in Europe. By the use of this drill mines can be penetrated 800 to 1000 feet through solid rock, vertically or horizontally, and perfect samples of ore or mineral taken out the entire depth.

The Nicholson File Company, Providence, employ 225 men full time, making 225,000 dozen files last year. Their list includes 400 different kinds and cuts. The specialty of the Nicholson file is its "increment (or increase) cut." These files are not cut with a uniform depth or space, and no two spaces can be found alike in the entire length. This irregularity is not only in the spaces between each tooth, but also in the heights of the teeth themselves, thereby completely removing the objections hitherto urged against machine files. This company bought the 150 tons of old machinery and the 30 patents of the Whipple File Company. More than one-half the stuff was resold as old junk. The Nicholson File Company organized in 1865, and occupy about three acres, covered by substantial brick buildings. They run two 75 horse-power and one 35 horse-power Corliss engines.

CONNECTICUT.

The Derby Silver Company, of Derby, owns one of the finest mills in the Narragansett Valley. The company was organized about three years ago, with a large capital, and numbers among its stockholders some of the heaviest capitalists in the State of Connecticut. They manufacture only goods plated on hard metal, and the style and finish of their spoons and forks has already given the young corporation a position along side of some of the oldest and best established concerns manufacturing similar goods. Ever since their organization they have kept their mill running each working day, and in these holiday times they have been pressed to their utmost capacity, notwithstanding the fact that they have run nights since the commencement of last fall a business. The mill is a stone structure, and the machinery is driven by water-power. Their goods, we are informed, are sold in every State and most of the Territories, Canada and the West Indies. The officers of the company are E. N. Shelton, president; G. W. Cheesman, treasurer; B. F. Culver, secretary; E. L. Britton, general agent.

PENNSYLVANIA.

On the morning of the 23d, the cylinder head of the engine, 20 inches in diameter, at the rolling mill of Marshall Bros. & Co., at Marlborough street wharf, Philadelphia, was blown off, the fragments flying about the mill. The accident was attributed to water in the cylinder.

During the latter part of last month, at a

depth of 391 feet, the Warwick Iron Company struck a vein of superior ore at their Boyertown shaft, in Berks county. It is claimed that the ore will yield from 55 to 60 per cent. in the furnaces.

A correspondent of the Norristown Herald says: "The weekly wages paid at Allan Wood and J. Wood & Bro.'s mills, at Conshohocken, Pa., when in full blast, not less than \$20,000 per week, an average of \$18 per week to each puddler and sheet iron worker. The average weekly wages of the puddlers, at \$5 per ton, is \$32, out of which he pays a helper some \$12. At the proposed reduction his wages would be but \$3 less, netting him about \$18 per week. One of the worst features of this strike is that even should they determine to go to work in January, there is no probability that the proprietors will have orders to fill. J. Wood & Bros. have had to refuse an order for 1000 bundles of iron, which they could not fill, owing to this strike. The order went to Pittsburgh. The number of men affected by the strike is a little more than 500. With all these out of work, and a prospect of discharge from other shops and mills, the outlook is gloomy enough.

The Crane Iron Company, Cataqua, is casting pipes for hot blast ovens which will weigh between two and three tons each.

The mill at Hollidaysburg is running about half time.

The Nimson Steam Forge and Axle Works, Allentown, have resumed operations.

The American Manufacturer says that quite a number of Pittsburgh manufacturers of staple glass wares have suspended operations, having accumulated large stocks, which must be disposed of before any more is produced. Manufacturers of specialties or novelties, however, will keep their works running, the demand for productions of this character being more nearly equal to the production.

On Thursday, Dec. 23, the Crucible Steel Casting Company, Pittsburgh (successors to Hussey, Dravo & Co.), completed a large shipment of cast steel reversible railroad frogs to the Phillips & Colby Construction Company, of Milwaukee.

A very handsomely fitted 8 inch roll train made for a Western company by J. L. Lewis, of Pittsburgh, was shipped last week. The American Manufacturer says: We also notice at this establishment, among other work, a 36,000 pound steam shear being fitted up, of similar style but larger than the one lately made there for Dilworth, Porter & Co.

The large iron roof frames, covered with corrugated iron, for the new Bessemer department of the Vulcan Iron Works, St. Louis, Mo., have just been completed by Wm. Scalf & Sons, of Pittsburgh.

The Birdsboro Pioneer says that E. & G. Brooke have built an extension to the stock house of Key-tone Furnace No. 2, the same being 42x53 1/2 feet. They have also commenced the erection of a molding house 30 feet square and 20 feet high.

The Blanchard Iron Company, of Marietta—capital, \$250,000—owned by Cyrus W. Field, of New York, and others, was incorporated on the 16th ult. We understand, also, that Mr. Field has taken \$20,000 stock in the Ohio Coal Company.

Mr. Thomas Thomas, formerly a roller in the Cataqua mill, has accepted a responsible position in the rolling mill at Lynchburg, Va., and left for his destination on the 10th of last month.

Stewart & Stevens, Philadelphia, have the contract for the wrought and cast iron work for the first floor of the new United States post office building in Philadelphia.

The Cataqua Mfg. Co.'s Rolling Mill, at Cataqua, was started on the 9th of December, with non-union men throughout.

The personal property of the North Pennsylvania Iron Company, sold by the sheriff recently, was bought by Mr. Ireman, a former director of the company.

MARYLAND.

Work in the puddling and rail mills of the Baltimore and Ohio Company, at Cumberland, has been suspended, and the bar mill was to shut down Dec. 24. The time for the resumption of work has not been set.

WEST VIRGINIA.

Recently in one week the mill department of the Riverside Iron Works, Wheeling, cut 7215 kegs of nails. This is not a bad showing for 126 machines.

OHIO.

Ironton Furnace is about to give a thorough test to the Sheridan coal.

The Kings Iron Bridge Company are building a large addition to their works, to cover their scales, cranes, tracks, &c. They are receiving orders ahead, sufficient, in all probability, to keep their works busy all winter, except during the few days required to take account of stock.

The Cleveland Wire Works, W. S. Tyler, proprietor, are building quite an extensive addition to their establishment, and adding some very costly machinery for the manufacture of wire cloth, for paper mills. They employ from forty to fifty hands, and find a market for their goods in every section of the country.

The Akron Chain Works, owned and operated by Mr. L. Chevier, has lately been considerably increased in capacity by the addition of a new building, which adds to the capacity of the works about one-fifth more. These works have been in full operation during the past year, during which time about 100 hands have been employed, turning out during the past year nearly 500 tons of chains of various sizes. Mr. C. makes a specialty of the best quality of chains of all sizes, competing with English manufacturers.

The Diamond Fire Brick Works, of J. Park Alexander, at Akron, after being idle weeks, were again put into operation on the 29th ult. During the two weeks extensive and important improvements and changes have been made in the machinery for pulverizing and cleaning the gravel used in the manufacture of the brick. A new grinding mill has been put in, the shaft of which revolves at the rate of 4000 per minute. The gravel, after being ground, is conveyed by a new set of elevators to a large bin on the second floor, from which it passes into the mixing mill. A team drying floor, 10x12 feet in size, has also been constructed, on which the gravel is dried before being ground.

The Youngstown Register, of the 30th, says that the shaft of the eight-inch train at the Girard Mill broke Monday night, the repairing of which will necessitate a delay of about one week. This mill was made right in the first place, and consequently they have few breakdowns, this being the first in many months. They have run night along, double turn, regardless of the times.

The Lawrence Furnace, of Ironton, is running on seventy-five per cent. of native coal, and making splendid iron.

WISCONSIN.

The Milwaukee Iron Works annually consume 60,000 tons bituminous coal, 7300 tons anthracite coal, 50,000 tons coke, 28,000 tons Iron Ridge and similar ore, 18,500 tons Lake Superior ore, 22,000 tons limestone; and they yield a product of 33,000 tons pig iron, 44,000 tons rails, 15,000 tons merchant iron, 9000 tons fish plates, and 2400 tons of car links and pins.

ILLINOIS.

A remarkable feat in glass manufacture was accomplished by the Phoenix Works, of La

Salle, the week before last, the furnace during that period having turned out 44,700 square feet of window glass, averaging nearly fifty-six boxes per blower. This is claimed to exceed the yield of any other furnace of similar capacity in the United States during the same length of time.

KENTUCKY.

The amount of capital invested in manufacturing enterprises in Louisville, is about \$20,000,000; the number of workmen employed, 16,000; the total of wages paid, \$8,000,000, and the annual product, \$55,000,000.

MICHIGAN.

The Deer Lake Iron and Lumber Company, Ishpeming, will blow out their furnace as soon as their stock of coal on hand is exhausted—sometime probably in February. The reason given is that, at the present prices of iron, they cannot manufacture pig metal at a certain profit; and not without chance of loss.

The Bancroft Furnace, at Forestville, is making its usual run of 16 tons of metal per day, nearly all or it being No. 1. Mr. L'Huillier, who has control of the works, keeps about 150 hands in constant employment, and by the closest attention to his business, will probably have a balance on the right side of the ledger. The furnace is in good order.

Special Notices.

WANTED TO PURCHASE.

A Second-Hand Steam Hammer.

Address, stating particulars, price, &c.,

F.,

Office of *The Iron Age*, 10 Warren St., N. Y.

Roller Wanted.

A first-rate sober Bar Mill Roller can find employment by sending his name and references to

B. M. R.,

Post Office Box 5149, N. Y. City.

No union men need apply.

THE CO-PARTNERSHIP HERETOFORE existing under the style of Hogan & Clarke, is this day dissolved by mutual consent.

Either partner will sign in liquidation.

The books may be found at No. 105 Broad Street.

J. J. HOGAN,

A. L. CLARKE,

Boston, December 31st, 1875.

THE UNDERSIGNED HAVE THIS DAY formed a Co-partnership under the style of HOGAN, CLAPP & WILKINS, as Hardware Commission Merchants and Manufacturers' Agents, at No. 105 Broad Street.

J. J. HOGAN,

GEO. W. CLAPP,

J. F. O. WILKINS.

Boston, January 1st, 1876.

CUTLERY BUYER, SALESMAN OF CLERK.

An experienced man desires an engagement.

Address "Energy,"

Office of *The Iron Age*, 10 Warren St., N. Y.

WANTED.—Situations as salesman in a manufactory of Hardware of any description. Twelve years' experience traveling in the West.

Address

W. C. THAYER,

Wood's Hotel,

116 & 118 Fifth Ave., Chicago, Ill.

BETTS & BURGER,

95 Chambers Street, N. Y.

Commission Merchants,

And Dealers in

Hardware and Cutlery Bargains.

Solicit Agencies and Consignments.

TRANSFER

ORNAMENTS

For Tin, Japan Ware, Safe and Carriage Manufacture.

JULIUS FECHTER, 104 John St., N. Y.

I sell my Carriage Ornaments to dealers only.

Partner Wanted,

with about twenty-five thousand dollars, in an old established Hardware Jobbing and Commission House. Reference given and required.

Address, in own name,

Post Office Box 2251, Boston, Mass.

HARDWARE.

FOR SALE in the best business part of Jersey City, a first-class Tool and Hardware business. Established about 25 years, and doing a fair business.

Apply to

H. LUTGEN.

57 Montgomery St., Jersey City.

SITUATION WANTED

By a man of ten years' experience in the Mercantile Iron business. Is thoroughly acquainted with Bar, Sheet and Plate Iron business, and has an extensive acquaintance throughout the West, having for seven years successfully filled the position of traveling salesman. Will be open to an engagement from January 1st. Address,

T. S., 60,000 lbs.,

Office of *The Iron Age*, 10 Warren St., N. Y.

SITUATION WANTED.—A young man, with 22 years' business experience, gained in responsible position, desires a situation. He is a good manager, an experienced salesman and an excellent correspondent, with best credentials as to responsibility, capacity, industry and experience. Will locate at any point offering him a business opportunity. Address,

Care Editor of *The Iron Age*. R. L. S.

DISCOUNT LISTS.

Hinges & Stanley Works' list, 10¢ to 20¢ each. Ties and Butts, & Union Mfg Co.'s, 10¢ to 20¢ each. Bolt, File and Hinge and Butt List.—Contains all the lists and discounts that are used. Price \$1.00. Dayton & Lamberson, 95 Chambers St., N. Y.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address,

IRON AND STEEL,

Care of P. O. Box 813, Bridgeport, Conn.

SPECIAL ATTENTION. To dealers in Blacksmiths', Coachmakers' and Machinery supplies generally: send for descriptive circular, &c., of the Improved

"Eclipse" Fan Blower.

The best and cheapest in the market; price only \$30, and guaranteed. Discounts liberal. Also, TIRE BENDER, DRILLING MACHINES, STEAM ENGINES, PUMPERS, &c. EZRA F. LAMBIE, General Agent, Lancaster, Pa.

Special Notices.

SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Augers and Bits, each running seventeen years; dated as follows: Dec. 19, 1855; January 31, 1860, and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law. Russell Jennings, DEER RIVER, Conn., Sept. 7, 1874.

WANTED TO PURCHASE,

100 tons good Second-Hand T Rails, 18 or 20 lbs. per yard.

Address, giving particulars,

PIPER & THOMPSON,

Lapeer, Mich.

TO LET,

A Light, Handsome Office.

Possession Immediately.

HERMANN BOKER & CO.,

101 Duane Street, N. Y.

MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 59 Cannon Street, London, E. C.

SCALE: First 3 lines, 3/4; every additional line, 10d. Price, 6d. per Copy, or 30, per annum, inclusive of postage to the United States.

HALL & HARBESON,

Manufacturers of Chemical & Physical Instruments, 191 Greenwich Street, N. Y.

SPECIALTY.—BURNER'S GAS BURNERS, for all heating purposes; BURNER'S IMPROVED GAS CONDUCTOR-FURNACES, with 10, 15 and 25 burners. Fine Brass and Metal Work made to order for Metallurgists, Chemists, Experimenters, Colleges, &c.

Steel Castings.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for cast iron requiring great strength. Send for circular and price list to

CHESLER STEEL CASTINGS CO.,

Evelling St., Philadelphia, Pa.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy.

A practical man with means is wanted to join a practical man who is already well established.

Address

CAR WHEEL FOUNDRY,

P. O. Box 134, Selma, Alabama.

Briesen's Patent Agency

FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA

AND EUROPE.

No. 258 Broadway, New York.

A. V. BRIESEN.

Important to Manufacturers.

RISSELL, WELLES & MILLET, Auctioneers and Commission Merchants, No. 15 Murray St., New York.

Solicit from Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

Business Opportunities.

New Capital Procured, Partnerships Arranged, and Commercial, Mining and Banking Corporations Organized, by

CLARKE, CHITTY & CLARKE,

Board of Trade Offices, New York.

P. O. BOX, 4071.

Merchant Iron or Nails

Wanted in exchange for 300 tons No. 1 Wrought Scrap Iron.

GILCHRIST & GRIFFITH,

Mount Pleasant, Iowa.

A. PURVES & SON,

Corner South & Penn Streets, Phila., Dealers in Scrap Iron & Metals, Machinery, Tools, Shafting & Pulleys, Steam Engines, Pumps & Rollers, Copper, Brass, Tin, Rabbit Metals, Foundry

Facings. Best Quality Pigot Brass.

Cash paid for all kinds of Metals and Tools.

DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors,

101 & 103 Duane St., N. Y.

For Sale, &c.

Rolling Mill For Sale.

Near the city of New York, with good dock and water front, and on the line of a railroad, with Rolls, Engine and Boilers, and all implements and buildings required for immediate occupation, and all in good order. Terms to suit any responsible parties.

W. R. WEMPLE, 69 Liberty St., N. Y.

FOR SALE.

An 1/2 inch mill train for making Merchant, Band and Hoop Iron. Will be sold cheap.

Apply to

W. W. JONES,

Near the Lehigh Valley Railroad Depot,

Allentown, Pa.

For Sale.

AT FURNACE SITE,

On the 20th Jan. 1876, at 12 o'clock, Noon. FOR SALE at Public Auction The Napanock Blast Furnace Property.

Description of the furnace is about as follows: Height of stack 4 feet high, and 12 feet bosh, built of stone to top of bosh, thence up of brick banded with heavy iron; lining is of fire brick 20 inches thick. Hearth and bosh are of fire brick. Tunnel head is 6 feet diameter. Hot blast was erected by Mr. McIlroy, of Reading, Pa.; is first-class, almost new. The power is of water, said to be of double the capacity; one of the best water powers in the State

Dec. 31, Chili Bars were reported at London £81, and Best Selected £88. The manufactures of Copper are sustained as follows: New Sheathing, 30c.; Bolts and Braziers, 31c.; Nails, 38c. @ 39c.; Bronze and Yellow Metal Sheathing, 21c.; Yellow Metal Bolts, 28c., and do. Nails, 21c., net cash.

Tin—Seems to be in a bad way again at London and Singapore, to judge from the telegrams to hand to-day. London from £81. 10/ has declined to £80. 10/ for Straits, and Singapore, which opened the year at \$22.75 per picul, is now down to \$22.25. The weakness at London might be caused by various circumstances, but the decline at Singapore admits of but one interpretation, viz., that the rebellion of the Malays has completely collapsed, and this will, in all likelihood, be confirmed by subsequent telegrams. Meanwhile we are aware by cable of the December deliveries in England and Holland, which were 1300 tons, the stock at London, January 1, remaining 6000 tons. Accounts are to hand, by mail, from Queensland, Australia, according to which large amounts of Tin had accumulated at the mines, but, as they were in the midst of the wool season out there, transportation was too dear to forward Tin to the railroad station. After a while these quantities will reach the seaboard, and proceed to England. Add to this the abundance growing up in Tasmania, and it will be perceived that in all the current year we shall have to contend once more with these depressing influences of too much Tin from Australia. If then production in Malacca proceeds vigorously, and both Banca and Billiton keep up, it will require an extraordinary impetus given to consumption to prevent Tin from receding even below £77, the lowest figure for Straits last year. When the full statistics, up to the 1st instant, are to hand from Europe, we shall be better able to judge. While Tin thus gives evidences of renewed weakness on the other side, we have remained very quiet here, and with little or nothing sold, either on the spot or to arrive. We quote, in gold, large lots: Straits, 19 1/2c.; English Refined, 19 1/2c.; ditto Common, 18 1/2c., and Banca, 32c. Tin Plates, on the other hand, evince a trifle more firmness since the commencement of the year, and we quote large lots, ordinary brands, gold, per box, as follows: Charcoal Bright, \$7.50 @ \$7.75; ditto Ternes, \$7 @ \$7.25; Coke Tin, \$6.63 1/2 @ \$6.75, and ditto Ternes, \$6.25 @ \$6.37 1/2.

Lead—Both consumers and dealers are slow in resuming business in the new year; we have, therefore, no sales to report beyond little 5 and 10 ton lots within the range of 5-87 1/2c. @ 5-90c., gold, for Common Domestic. Soft Missouri and Pittsburgh Selected we nominally quote 7 1/2c., currency. Foreign is also nominal at 7 1/2c., gold. The accounts from Europe continue quiet firm, sellers declining to make contracts ahead. The short supplies of Spanish have caused a further improvement of about 5/ per ton, and neither that kind nor English can be readily purchased at London, either in quantities on the spot or for prompt deliveries, unless buyers are willing to pay the top rates. The interference of purchases for government account has chiefly brought about this state of affairs, and this may go on for some time longer, or become even more important, when, later on, Russia resumes drawing Lead from Western Europe. While this is the case, Spanish production has failed to come up to expectations. Manufactures of Lead have remained steady as follows: Bar, 8 1/2c.; Pipe, 9c.; and Sheet, 9 1/2c., less 10 per cent. to the trade.

Spelter and Zinc—Spelter has been quietest here at 7 1/2c., currency, less the discount, for Domestic, and 7 1/2c. @ 7 1/2c., gold, for Silesian. Accounts by mail are to hand from Hamburg, according to which the greatest firmness prevailed in England, with a hardening tendency, owing to the deficiency in the supply of Calamine, which is partly drawn from Spain, as well as of Belgian Spelter, of which till April all that was to be had was sold ahead. In consequence of this dearth, Belgian Spelter commanded free on board at Rotterdam, £25. At Breslau, between 4000 and 6000 cwt. Silesian, for delivery in February and March, had brought 24 marks, and 4000 W. H. for England, 24 50 marks, cash. Sheet Zinc is quiet at 9c., gold.

Antimony has remained quite firm at 14 1/2c. @ 14 1/2c., gold, as to brand and quantity. The news from England is favorable, the two leading smelters suffering from an insufficient supply of the raw material.

COAL.

We have nothing new to report in the Coal market. The demand for Anthracite is limited, and business is dull, both at wholesale and retail. As the season of 1875 is over, there is a strongly increasing interest in all directions to know what the programme of the Coal combination will be this year. It is understood, however, from the most reliable sources, that the combination will not deviate from the policy of prices adopted last season, and the rates will not be advanced beyond those now current, and which have ruled throughout the year.

The quantity of Coal sent from the Schuylkill region for the past week was 28,569 tons, against 50,208 tons for the corresponding period of last year. Decrease, 21,639 tons. The quantity sent from the beginning of the new year, December 1, was 265,014 tons, against 340,871 tons for the same period last year. Decrease, 75,857 tons.

The quantity sent from all the regions for the week was: Anthracite, 246,305 tons, and Bituminous, 47,061 tons; total, 293,366 tons, against 299,948 tons Anthracite, and 50,877 tons Bituminous for the corresponding period of last year; total, 296,725 tons. Increase of Anthracite, 16,457 tons; increase of Bituminous, 10,784 tons. Total increase, 27,241 tons.

The quantity sent from all the regions for

the year was Anthracite 30,386,525 tons, and Bituminous, 3,968,435 tons; total, 24,290,020 tons, against 20,378,391 tons Anthracite, and 3,502,327 tons Bituminous; total, 23,780,718 tons for corresponding period of last year. In crease, 509,302 tons.

The following are the cargo prices of the different companies' Coal delivered at the various shipping ports near New York during the month of January:

	L. Str.	Gr.	Grz.	Sto.	Cht.
Lackawanna D. & H.	5 06	5 15	5 25	5 65	6 10 1/4
Wilkesbarre	5 03	5 15	5 25	5 65	6 10 1/4
Plymouth Hill A. & C.	5 03	5 15	5 25	5 65	6 10 1/4
Pittston, open market	5 10	5 15	5 20	5 45	5 85 1/4
Scranton	5 00	5 10	5 20	5 45	5 90 1/4
Old Company's Summit	5 50	5 55	5 65	6 10	6 15 1/4
N. Y. Lehigh Coal Ex.	5 53	5 58	5 68	6 10	6 15 1/4
Honey Brook Lehigh	5 53	5 58	5 68	6 10	6 15 1/4

Freights from the above shipping ports to New York city are as follows, including the unloading:

Hoboken	40	Rondout	50
Weehawken	40	Killbuckport	40
Port Jervis	40	South Amboy	45

We quote as follows: Anthracite, \$4.05 to \$6.10; Cumberland, \$6.25 @ \$7.45; West Virginia, \$6.75; James River Steam, \$6.25; James River Carbonite, \$9 @ \$9.50; Kanawha House, \$11.50; American Gas, \$6.75 @ \$7.25; American Cannel, \$12 @ \$14; Pennsylvania and Westmoreland, \$6.75; Newburgh Orrel, \$6.50; Sterling Ohio, \$10; Ince Hall, \$17 @ \$18; Liverpool House Cannel, \$11; Liverpool Gas, \$12; Newcastle Gas, \$7; Scotch, \$7.60.

The Coal transported over the Cumberland Branch Railroad during the year ending Dec. 31, 1875, amounted to 216,385 tons, as against 249,684 tons shipped in the corresponding period of last year, showing a decrease of 32,606 tons. Over the Cumberland & Pennsylvania Railroad, for the same period, the shipments were 1,942,891 tons, against 1,965,154 tons shipped in 1874; a decrease of 22,263 tons. The aggregate amount of Cumberland Coal shipped by the various companies so far this year amounts to 2,281,415 tons.

OLD METALS, PAPER STOCK, &c.

The Old Metal market is laboring under a season of dullness, and dealers find it an impossibility to dispose of any considerable quantity, no matter how great the concessions may be. The Rag and Paper Stock market has somewhat improved since last week, and some grades of Rags are in active demand. We quote the following as the current purchasing rates:

Old Metals—Copper, 16c. @ 17c. per lb.; Yellow Metal, 11c.; Brass, 10c. @ 12c.; Composition, heavy, 13c. @ 14c.; Lead, solid, 5 1/2c.; Tin Lead, 5c.; Zinc, 4 1/2c. @ 4 3/4c.; Pewter, No. 1, 18c.; do. No. 2, 3c. @ 12c.; Spelter, 3 1/2c.; Cast, do., 3 1/2c.; Machinery, do., 3 1/2c.

Rags, &c.—Canvas, Linen, 4 1/2c. @ 5 1/2c.; do. Cotton, No. 1, 5 1/2c. @ 6 1/2c.; No. 2, 2 1/2c.; White, No. 1, 5 1/2c.; No. 2, 4c.; Colored, do., 2c. @ 2 1/2c.; Mixed, Woolen, 2c. @ 3c.; Soft, do., 5c. @ 5 1/2c.; Gunny Bagging, 1 1/2c.; Jute Butta, 1 1/2c. @ 2c.; Kentucky Bagging, 3c.; Book Stock, 3c.; Waste Paper and Scraps, 1 1/2c.; Kentucky Bale Rope, 4c.; Oakum, Jute, No. 1, 4 1/2c. @ 5c.; do. No. 2, 3c.; Tarred Shaking, 1c. @ 1 1/2c.; Grass Rope, 2 1/2c. @ 3c.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending Jan. 4, 1876:

Hardware.	Sanderson Geo. & Co.
Baker Hardware & Co.	Casks, 7
Chains, cks., 23	
Waefer & Dymsters.	
Iron hook nails, bbls, 77	
Metals.	
Bruce & Cook,	
Tin plates, bxs., 609	
Brown Bros. & Co.	
Tin, slabs, 317	
Lamarche H.	
Boiled zinc, cks., 21	
Schom, Bache & Co.	
Tin, cs., 6	
Order.	
Spiegel, lots, 2	
Steel.	
Colby J. L. & Co.	
Wire, bbls., 125	
Tin plates, bxs., 3315	
Tin, slabs, 3256	

PHILADELPHIA.

Office of The Iron Age, 230 South Fourth st., PHILADELPHIA, Jan. 5, 1876.

Pig Iron—During the past week, with one or two exceptions, there has been no business doing whatever, the attention of the trade having been directed to stock taking, &c., and no desire has been manifested to enter into any extended operations. Sales are reported to the Pennsylvania Steel Company of several large parcels at outside points, but the price has not transpired; these purchases are to cover the sales of Steel Rails made by this company, and reported two weeks ago. In the absence of further sales, we repeat our quotations of last week, which fairly represent the market, viz: No. 1 Foundry, \$23 to \$25; No. 2 Foundry, \$21; Gray Forge, \$20 to \$21.

RAILS—No business of importance has transpired since our last, but negotiations are said to be pending which will probably result in further large sales. In the meantime we repeat our former quotations, viz: \$65 to \$67 at the mills for Steel Rails, and \$42 to \$46 for Iron Rails.

OLD RAILS—No business has transpired since our last report; the price is nominally \$22.50 to \$24, but buyers are not to be found at these figures. We have it stated, on good authority, that large lines could be placed at \$22, but holders ask more money.

SCRAP—Business is entirely nominal, nothing whatever doing. We repeat former quotations, viz: \$28.50 for Wrought, and \$16.50 to \$18.00 for Scrap.

Sales are reported of 1000 tons Old Rails, private terms, and 2000 tons Glendon Gray Forge at \$22, delivered here.

PITTSBURGH.

PITTSBURGH, Jan. 4, 1876.
The iron trade continues very dull, as it nearly always is at this particular time, but it is thought there will soon be a change for the better; that the clouds that overshadowed the business during the past year will gradually break up and disappear. The demand for Pig continues light, restricted as it is to supply-

ing immediate actual wants; the feeling prevails that hard pan has been almost, if not altogether, reached, which in connection with reduced stocks and a very light production, has given a firmer tone to the market, and an increased trade soon is not improbable. The stocks of raw iron, not only here, but at those points tributary to this market, are reported as being very much reduced, and even if trade should brisk up, it is not likely that many of the furnaces now stopped would be started up before spring. It is not generally expected that prices will advance much, but as already intimated, an increased demand within the next few weeks is confidently expected. In manufactured iron there is nothing particularly new to report. Business is dull just now, as it nearly always is, but manufacturers generally are feeling more hopeful in regard to the future, and it is now believed that there will be at least an average spring trade, and as stocks are light, both in the hands of jobbers and consumers, the demand may exceed present anticipations. There is fair demand for Horse Shoes, but the Nail trade is dull and is likely to continue so until about the first of next month. Business is nearly always dull during January and February. There has been no failures in iron circles for some time now, and the rumors, which were so numerous on the streets a few weeks ago, have nearly all subsided. It was expected that if there were any shaky firms that the 1st of January would bring them to time, but none have been reported as yet.

Pig Iron—No. 1 Foundry, \$25 to \$26, 4 mos.; No. 2, \$23 to \$24; Gary Forge, \$22 to \$25; White and Mottled, \$19 to \$20; Charcoal Mill, \$22 to \$23; do. Foundry, \$27 to \$30.
BAR IRON—2 1/2 to 2 3/4, 60 days.
NAILS—\$2 1/2, 60 days, two per cent. off for cash.
HORSE SHOES—1 1/4 cts. cash for round lots, and 5/8c. @ 3/4c., in a jobbing way.

CLEVELAND.

Messrs. C. E. BINGHAM & Co., 25 West Main street, under date of Jan. 3, quote the iron market as follows, 4 mos. time:

FOUNDRY IRON.	
No. 1 Lake Superior Charcoal	\$29.50—4 m.
No. 2	28.00—4 m.
No. 1 Anthracite	26.50—4 m.
No. 2	25.00—4 m.
No. 1 Bituminous	26.50—4 m.
No. 2	25.00—4 m.
No. 1 Cherry Valley Am. Scotch	29.50—4 m.
No. 2	27.00—4 m.
No. 1 Massillon	28.00—4 m.
No. 2	26.00—4 m.
No. 3	23.00—4 m.

CAR WHEEL AND MALLEABLE IRON.

No. 3 Lake Superior Charcoal	\$27.50—4 m.
No. 4	26.00—4 m.
Nos. 5 & 6	29.00—4 m.

BESEMER IRON.

Nos. 1 and 2 Lake Superior Charcoal	\$28.50—4 m.
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FORGE IRON.

No. 1 Gray	\$28.00—4 m.
White and Mottled	24.00—4 m.

BALTIMORE.

Messrs. WYTH & BROTHER, Iron and Steel merchants, South Charles and Lombard streets, report us the following prices under date of Jan. 4: The past week has proved a quiet one, owing to the holidays, stock taking and preparing for the New Year. We quote the market depressed, with unaltered list:

AMERICAN REFINED BAR IRON.

1 to 6 wide by 1/2 to 1 thick, 1/2 to 10 to 12 long	\$10.00—4 m.
1 to 6 wide by 1 1/2 to 2 thick, 1/2 to 10 to 12 long	11.00—4 m.
Round and square, ordinary sizes, from 3/4 to 2 inclusive	3.50 to 4.00—4 m.
Hoop Iron, 1 1/2 wide and upward, 3/4 to 4c.	
Band Iron, from 1 1/2 to 4 wide, 3/4 to 3 1/2c.	
Horse Shoe Iron 1 1/2 wide by 3/4 to 1 thick	3.50 to 4c.
Norway Nail Rods	7 to 7 1/2c.
Black Diamond Cast Steel, Plats, Squares and Octagons, ordinary sizes	15 1/2 to 16c.
Machinery Steel	10 to 11 1/2c.
Cast Spring Steel	10 to 10 1/2c.
Homogeneous Steel Plate	10 to 10 1/2c.
Perkins' Horse Shoes, per keg of 100 lbs.	\$5.12 1/2
Male Shoes	6 to 6 1/2c.
Common Horse Nails, from 14c. to 18c. per pound.	
Putnam Horse Nails	23 24 25 26 28c. per lb.
Globe Horse Nails	20 24 25 26 28c. per lb.
R. R. Spikes	5 1/2 by 9-16 at 2-10 to 3c. per lb.

Messrs. R. U. HOFFMAN & Co., Iron and commission merchants, Nos. 23 and 25 South Frederick street, report the Pig Iron market as follows, under date of Jan. 3: There being no sales of Pig Iron, any note during the past week, we continue former quotations, with the market dull:

Baltimore Charcoal	\$22.00 @ 23.00
Virginia	25.00 @ 24.00
Anthracite No. 1	24.00 @ 25.00
No. 2	22.00 @ 23.00
No. 3	20.00 @ 22.00
White and Mottled	18.00 @ 19.00

CINCINNATI.

Messrs. L. R. HULL & Co., under date of Jan. 1, write us as follows: Pig Iron—The demand and prospects continue about as reported in our last, with no change, as yet, in prices:

HOT BLAST CHARCOAL.	
Hanging Rock No. 1, 1/2 ton	\$25.00 @ 26.00—4 mos.
" No. 2	23.00 @ 24.00—4 mos.
" Forge	21.00 @ 22.00—4 mos.
Southern Brads	21.00 @ 24.00—4 mos.
" Forge	21.00 @ 24.00—4 mos.
Virginia No. 1	24.00 @ 25.00—4 mos.
No. 2	22.00 @ 23.00—4 mos.
" Forge	21.00 @ 22.00—4 mos.

HOT BLAST STONE COAL & DO. COKE.	
Hanging Rock No. 1, 1/2 ton	\$24.00 @ 25.00—4 mos.
" No. 2	22.00 @ 23.00—4 mos.
Red Short No. 1	27.00 @ 28.00—4 mos.
" Forge	24.00 @ 25.00—4 mos.
Am. Scotch, No. 1	24.00 @ 25.00—4 mos.

COLD BLAST CHARCOAL.	
Hanging Rock Charcoal	\$20.00 @ 21.00—4 mos.
Mission	35.00 @ 40.00—4 mos.
Southern Brads	30.00 @ 40.00—4 mos.
Machinery and Forge	30.00 @ 35.00—4 mos.
Blooms	@ 40.00—4 mos.

BOSTON.

JAN. 1.—Pig is without life or interest, quoting as last noted from \$19 to \$26, according to brand. Bar has had a dull week, not an unusual incident for the last days of the year. Prices are unchanged, \$51.50 for guaranteed reeled being of uniform jobbing price. Common iron is without quotation or sale. Steel is very quiet, a dull hardly anticipated from the inquiries made a week ago. Prices are unchanged. We quote: American Tool, 14c. to 15c.; American Machinery, 9c. to 9 1/2c.; Bessemer Tires, 6 1/2c. to 7 1/2c.; Sweet's Excelsior Tire, 8 1/2c. to 12c.; English Tool, 16c. to 18c., gold. Copper remains in a staid and steady position, quoting 23 1/2c. to 25 1/2c. for spot or futures, according to the wants of buyers. For manufacturers we quote New Sheathing, 30c.; Bolts and Braziers, 31c.; Yellow Metal Bolts, 28c. to 29c. Lead is quiet and steady. Stocks are still very light, and little offering to arrive. We quote Pig 6c. for Domestic, and 6 1/2c. to 6 3/4c. for Foreign; Sheet and Pipe Lead, 9c., currency; Tin Lined Pipe, 16 1/2c.; Bar Lead, 3c., less usual trade or 10 per cent. discount. Antimony is firm, with a small inquiry at 18 1/2c. Spelter is strong and quiet at 7 1/2c. 30 days, and 7 1/2c. prompt cash, all currency. Silesian is dull at 7 1/2c.

Tin is without interest in either Pig or Plate. The market continues steady. We quote: Straits, 19 1/2c.; Banca, 32c.; Refined English, 18 1/2c.; do. do. Plates are active; we quote: Charcoal I. C., \$7.50; Coke, \$6.75 to \$7; and Ternes at \$6.25 to \$6.75, gold.—Com. Bulletin.

RICHMOND.

MR. ASA SNYDER, Iron Merchant and Furnace Agent, Richmond, Va., writes as follows under date of Jan. 3: There is considerable inquiry for Charcoal Irons, and sales of about 200 tons have been made as an opening for the New Year. Prices have manifestly reached bottom. The indications are that purchasers are willing to buy freely at present figures. Quotations are firm at last report.

Virginia cold blast Charcoal Pig Irons	\$27.00 @ 33.00
hot	34.00 @ 39.00
Va. hot blast Coke Pig Iron, No. 1 ex.	24.00 @ 25.00
" No. 2 ex.	22.00 @ 23.00
" No. 3 ex.	21.00 @ 22.00
Virginia Anthracite, No. 1 ex.	25.00 @ 26.00
" No. 2 ex.	23.00 @ 24.00

LOUISVILLE.

Messrs. GEO. H. HULL & Co., under date of Jan. 3, write us as follows: The market is dull, but without change in prices. The usual time, four months, is allowed on the quotations below:

HOT BLAST CHARCOAL.	
No. 1 Fdry, from Hanging Rock Ores	\$25.00 @ 26.00
" 2	23.00 @ 24.00
" 1 Mill, " " " "	22.00 @ 23.00
" 1 Fdry, from Alabama, Georgia and Tennessee Ores	23.00 @ 24.00
" 2	21.00 @ 22.00
" 1 Mill, from Alabama, Georgia and Tennessee Ores	21.00 @ 22.00

HOT BLAST STONE COAL AND COKE.	
No. 1 Fdry, from Hanging Rock Ores	\$23.00 @ 24.00
" 2	22.00 @ 23.00
" 1 Mill, " " " "	21.00 @ 22.00
" 1 Fdry, from Alabama, Georgia and Tennessee Ores	23.00 @ 24.00
" 2	22.00 @ 23.00
" 1 Mill, from Alabama, Georgia and Tennessee Ores	21.00 @ 22.00

COLD BLAST CHARCOAL.	
Car Wheel from Hanging Rock Ores	\$25.00 @ 40.00
" " " " " "	28.00 @ 30.00
" " " " " "	28.00 @ 30.00
Car Wheel from Kentucky Ores	28.00 @ 38.00

FOREIGN.

FRANCE.

(Monteur des Interests Matériels).
PARIS, Dec. 19, 1875.—Metals in general have remained quiet in the European markets, due in part to the season, and in part to a gradually tightening tendency in money matters. Copper is very little has transpired in the European Metal markets in this, the leading article. Consumers do not purchase beyond urgent requirements, but the metal is, nevertheless, firmly held, and holders show no anxiety to part with their property. This is owing to the good statistical position which characterizes Copper for some time past. Copper here forms an exception, and shows signs of weakness, with very few exceptions. We quote, deliverable at Havre, Chili Bars, 213 francs; Common do., 210; Ingots, 215; English Tough Cake, 217.50, and pure Corcoro Ore, 210; Marseilles is unaltered at 215 francs for small ingots. Tin has remained in the same unaltered position, and is assumed since the beginning of the month. Little has been doing here, and the tendency has been one of weakness. Thus Banca cannot be quoted by us above 525 francs, deliverable here, or at Havre; Straits, 217.50; and English at Havre or Rouen, 215; Marseilles is quoted at 220 for Straits and Billiton. The general firmness in Lead has spread to our own market, although large dealers do not transpire; we quote the various kinds 26.50 francs here, and 26 at Havre; Marseilles is firm at 25.50 to 26 francs. What little there is to be met with of Spelter anywhere is held with increased firmness, especially in our own market. We quote the same 66 to 68.50, deliverable at Havre. Marseilles reports no change in Iron. We have no change to report. Meanwhile the most capable men in France in Iron industry are incessantly endeavoring to introduce new methods of producing and working Iron; our engineers, government as well as civil, study improved methods of transportation, and the perfecting of our system of river navigation. In due time the united talent of these men will endow France with valuable innovations, and the industrial crisis will be productive of some lasting good. Coal.—The cold weather which held out such a fair prospect of activity to the coal dealers of Paris has suddenly made room for a more genial temperature. In the Loire district the metal which has prevailed there has predominated. At the North prices have remained stationary, despite the efforts made by the coal companies to bring about some improvement.

BELGIUM.

(Revue Industrielle).

BRUXELLES, Dec. 19, 1875.—Iron.—Iron industry in Belgium remains stagnant to such a degree that the less we speak about it the better. Steel is not in quite as miserable a plight, but the competition between the various countries of the continent of production begins to render things uncomfortable. Bessemer Steel production in the world is assuming proportions which cause the same now already to greatly exceed consumption. Great Britain now possesses 21 establishments, with 105 converters; Prussia, 14 with 61; Austria, 12 with 80; Bavaria, 2 with 4; Saxony, 1 with 4; Alsace, 1 with 2; France, 8 with 25, and the United States, 8 with 25; this gives 76 world wide, with 347 converters. The productive capacity for 300 working days at 50 per diem and per converter is therefore 2,460,000 tons annually. Now, it so chances that the consumption of Bessemer Steel in the whole of Europe does not exceed between 500

£57,880,697. This includes not only coal, but all kinds of ores, iron, copper, tin, lead, zinc, and such out-of-the-way ores as those of tungsten and bismuth. The total value of the metals produced from the ores of the United Kingdom was £19,339,070. The coal amounted to 125,043,257 tons, valued at £45,849,154. The value of the ores was £11,985,563. From this it would appear that the gross gain obtained by converting the ores into metals was £7,553,507. Now we know that the iron trade was not carried on at a loss during 1874. If we suppose that the net profits amounted to £1,553,567 only, we have remaining to cover wages, the loss by depreciation of plant, and the cost of coal, but £5,000,000. If we allow two-thirds of this sum to have been expended in coal, we find that not more than £1,666,667, or thereabouts, of all the coal raised in the kingdom was used up in converting ores into metals. This statement we find it impossible to credit. The deductions we have drawn are not found in Mr. Hunt's paper; we have drawn them from his figures, and they require explanation which he alone can supply. The most important statement made by Mr. Hunt is, that in 1874 there was a great falling off in the mineral and metal trades as compared with 1873. This the falling off in the value of coal was £1,782,086, and in pig iron £1,581,367. That of other metals only reached £288,981. The total decrease in the value of coal and metals was £3,652,404. Mr. Hunt also tells the decrease in 1874 was very marked, reaching as much as 3,592,832 tons; but there was an increase in the export of patent fuel, coke, &c., amounting to 1,509,639 tons. "It is a curious fact that less coal was used for domestic consumption in London alone by over 400,000 tons. Possibly this result is due to the use of more economical grates, and to greater care being taken to burn coal to advantage. It is a suggestive fact that London can do with less coal by 400,000 tons in one year than she found necessary in another. Here is a text for inventors of economic ranges and stoves."

A WEEK'S WORK IN BIRMINGHAM.
Some curious person fires a statistical bomb-shell into our midst, stating that a week's work in Birmingham comprises, among its various results, the fabrication of 14,000,000 pens, 6000 bedsteads, 7000 guns, 300,000,000 cut nails, 100,000,000 buttons, 1000 saddles, 5,000,000 copper or bronze coins, 20,000 pairs of spectacles, six tons of papier mache wares, over £30,000 worth of jewelry, 4000 miles of iron and steel wire, ten tons of pins, five tons of half pins and hooks and eyes, 120,000 gross of needles, 500 tons of nuts and screw bolts and spikings, fifty tons of wrought iron hinges, 350 miles length of wax for vestas, forty tons of refined metal, forty tons of German silver, 1000 dozen of fenders, 3500 bellows, 800 tons of brass and copper wares—these, with a multitude of other articles, being exported to almost all parts of the civilized world.

FAILURE OF THE PARKFIELD IRON COMPANY.
At the first meeting of the creditors of the Parkfield Iron Company, of Wolverhampton, last week, the statement of affairs showed: Liabilities—unsecured creditors, £35,569; creditors fully secured, £39,540; creditors to be paid in full, £914; liabilities upon bills, £209; total liabilities, £76,072. To meet this there was £33,500 as the value of the property secured; but the £3959 credit balance between this sum and the claims of the assured creditors, though added by £282 from other sources, was by the amounts to be paid in full, reduced to £2027, which was left to pay £35,569. Liquidation was resolved upon.

IRON MAKING IN INDIA.
I enclose you a full copy of a very interesting letter which has been sent home by Mr. Walter Ness, a gentleman who is engaged in Central India in trying to make iron entirely and exclusively from the native ores by means of the native coal. You will notice that he states that about 20,000,000 tons of iron ore is found in the native coal, have already been proved, and that there is an abundance of magnetic ore, yielding 60 to 70 per cent. of pure iron, near Warorah, whence he writes. By perusing the narrative he has sent home, however, it will be seen that the coal is hardly better than lignite, and that there will be a great deal of difficulty in iron making until some better fuel, of different process, be found out. The letter is, nevertheless, very well worth perusing.

THE ABERDEAR AND PLYMOUTH IRON COMPANIES.
At a meeting held in London, last week, of the creditors of Messrs. Richard Fothergill, M. P., and E. T. Hanky, trading as above, a report was submitted, and afterward adopted, stating that a limited liability company had been founded to take over the works, which were valued by the Marquis of Bute's agent at over £1,200,000. They were charged with two heavy mortgages, the one on the Aberdear property for £128,000, and the other on the Plymouth property £183,000, and these were the only existing charges on the works. The arrangements for the new company was as follows: The families and friends of the debtors had consented to subscribe a sum of £26,000, bearing interest at 5 per cent., so that none of the creditors were asked to subscribe the working capital. This amount would stand as a first charge after the original mortgages; and the payment of interest on the mortgages, amount to be appropriated to sinking fund, and the 5 per cent. on the £26,000, would amount to about £24,550 per annum. It was proposed that the whole of the profits should be appropriated toward the gradual extinction of what were called the debentures, which would be issued to the creditors. The total amount of these debts was over £200,000; but it was expected that realizations would reduce the amount to about £50,000. These creditors' debentures will not bear interest, but the profits would be appropriated to their redemption. There was a very considerable chance of success in this arrangement. Since the suspension of the trustee, Mr. Turquand, had been carrying on the works at a satisfactory profit, which led them to believe that the future working would not be otherwise than satisfactory. The company would be under the superintendence of a committee of control, consisting of five gentlemen representing the largest creditors, with one gentleman representing the first mortgage debt, and another the new capital subscribed; in all seven of a committee.

SCOTCH PIG IRON.
held pretty firm during the earlier part of last week, and a considerable number of sales were reported on the basis of 63 3/4, but later on there were symptoms of a falling off to the extent of about sixpence to ninepence per ton. Makers' brands have remained steady, and in some few instances are clearly firmer. There was a fair average shipping business last week, but as will be seen from the appended figures the total was 700 tons below that for the corresponding week of 1874. There has been a decrease of 430 tons during the time under notice in the pig iron stored in Connal & Co.'s premises, the quantity now held there being 63,989 tons. Freight appears to be unchanged, and ballast pig iron is quoted 47 1/2 alongside—as before.
Writing from Glasgow, December 17, Messrs. James Watson & Co., said: "The price of Scotch pig iron warrants has been easier since the date of our last, with a large business done from 63 1/2 to 62 3/4, each, closing firmer at 62 3/4. Shipments last week were 8017 tons against 8672 tons in the corresponding week of 1874."

G. M. B. at Glasgow	No. 1.	No. 3.
Gartshore,	64 1/2	63 1/2
Coltness,	77 1/2	66 1/2
Summerlee,	70 1/2	64 1/2
Langloan,	73 1/2	65 1/2
Cambridge,	67 1/2	61 1/2
Cal. ex. at Port Dundas,	70 1/2	64 1/2
Leamington,	70 1/2	65 1/2
Edinburgh,	64 1/2	63 1/2
Dunblair,	63 1/2	62 1/2
Spotts at Leith,	63 1/2	62 1/2
Kinnell at Boness,	65 1/2	62 1/2

Messrs. John E. Swan & Brother's (limited) prices current, Glasgow:

Glasgow Brands.	Furnace	14	Furnace	14	Furnace	14	Prices.
	14	14	14	14	14	14	No. 1, No. 3, No. 4
Gartshore,	13	3	16	23 1/2	63 1/2	65 1/2	
Coltness,	12	0	14	27 1/2	66 1/2	68 1/2	
Summerlee,	6	0	14	27 1/2	66 1/2	68 1/2	
Langloan,	6	0	14	27 1/2	66 1/2	68 1/2	
Govan,	4	0	14	27 1/2	66 1/2	68 1/2	
Cambridge,	3	1	14	27 1/2	66 1/2	68 1/2	
Calder,	3	1	14	27 1/2	66 1/2	68 1/2	
Shotts,	3	1	14	27 1/2	66 1/2	68 1/2	
Shotts Ordinary,	3	1	14	27 1/2	66 1/2	68 1/2	
Carubro,	2	0	14	27 1/2	66 1/2	68 1/2	
Wishaw,	2	0	14	27 1/2	66 1/2	68 1/2	
Monkland,	2	0	14	27 1/2	66 1/2	68 1/2	
Dunblair,	2	0	14	27 1/2	66 1/2	68 1/2	
Clyde,	2	0	14	27 1/2	66 1/2	68 1/2	
Quarter-Clyde,	2	0	14	27 1/2	66 1/2	68 1/2	

* 1 c. b. Glasgow, 1/2 per ton, extra.
Glasgow Warrants, 3-5 No. 1; 2-5 No. 3, g. m. b., 62 1/2.

WEST COAST BRANDS—f. o. b. At Glasgow.	Furnace	14	Furnace	14	Furnace	14	Prices.
	14	14	14	14	14	14	No. 1, No. 3, No. 4
Glengarnock,	7	2	9 1/2	69 1/2	64 1/2	65 1/2	
Ardeer,	4	1	5 1/2	69 1/2	64 1/2	65 1/2	
Edinburgh,	6	2	8 1/2	69 1/2	64 1/2	65 1/2	
Langloan,	3	0	14	64 1/2	63 1/2	63 1/2	
Muirkirk,	3	0	14	64 1/2	63 1/2	63 1/2	
Portland,	3	0	14	64 1/2	63 1/2	63 1/2	
Dalmellington,	6	2	8 1/2	64 1/2	63 1/2	63 1/2	

EAST COAST BRANDS—f. o. b. in the Forth.	Furnace	14	Furnace	14	Furnace	14	Prices.
	14	14	14	14	14	14	No. 1, No. 3, No. 4
Kinnell,	3	1	4	65 1/2	62 1/2	60 1/2	
Almond,	2	1	3	65 1/2	62 1/2	60 1/2	
Carron (Scot. d.),	4	2	6 1/2	70 1/2	67 1/2	64 1/2	
Lochelly,	0	4	4	70 1/2	67 1/2	64 1/2	
Lumphians,	0	2	2	70 1/2	67 1/2	64 1/2	
Bridgess,	0	2	2	70 1/2	67 1/2	64 1/2	

Furnaces in blast in Scotland, Dec. 17, 1875—114.
Producing about 168 tons per week.
Furnace, per week.

DISTRESS IN THE NORTH.
There is still no improvement whatever in the general state of the North of England iron trade, so that the distress previously adverted to by me in these columns, is greatly on the increase. On Saturday 300 men were discharged at Darlington and 300 at Middlesbrough, in addition to those idle before. The Darlington Iron Company have just laid off 42 more puddling furnaces and a rail mill. The great works of Bolewark, Vaughan & Company, at Middlesbrough, are nearly at a standstill, as also are those of Hopkins, Gilkes & Company. The Britannia Iron Works have been fortunate enough to obtain an order for 3000 tons of rails for China, which will serve for two or three weeks. At Stockton-on-Tees relief is being distributed, in the shape of soup and bread, to over 1100 families, comprising 5000 persons. The distress is so marked and general that it is stated that many persons other than iron workers are affected. The iron rails of the district are 46 1/2 to 46 13/4, and ship plates 47 to 47 1/2, per ton.

TRADES OF SHEFFIELD.
As the year draws near to its termination, there is everywhere a clearly manifested desire to curtail operations as much as possible, so as to carry as little work forward into the new year on account of this year's orders as may be. The result in many instances is a still greater depression of trade than has hitherto been apparent, whilst in other cases the very opposite result is apparent. In some branches of industry the men are now working longer hours than for some months past, from a praiseworthy desire on the part of their employers that the workmen shall earn as much as is really possible prior to the new year, and the Christmas holidays. These holidays are this year likely to be of unusually long duration, unless, as is hoped, some unforeseen circumstance renders it necessary to get work out of hand with unusual dispatch. Taken all in all, I am of opinion, as the result of a pretty intimate and extensive knowledge of the trade and of those engaged in it, that the cast steel trade is at present the most sluggish of all the staple industries of this town or district. Few, if any, of the old established and best known firms have any orders worth mentioning on their books, so that it is by no means surprising to find that the men are restricted to three turns weekly, and that there is no prospect of any early amendment. Much of this dullness and stagnation is to be attributed to the slender requirements of the United States for steel. Trade there is said to be in a most deplorably bad condition. An English iron works manager who had been over in Pennsylvania and other Eastern States for nearly a year on business, returned to Sheffield the other day, and he depicts matters in very gloomy colors. He states that matters in England are infinitely better—had as they are—in the States, where there is literally no business doing, and no commercial confidence whatever. This picture may be a little exaggerated, but the effects on the Sheffield steel trade of American stagnation cannot very well be overestimated.

There is some talk in iron trade circles here of an attempt to form a national organization of iron and steel manufacturers, with the object of taking united action in all matters relating to those industries commercially and fiscally, if the word be permissible, but not to interfere with the existing associations, which deal with the question of wages, nor with the province peculiar to the Iron and Steel Institute. As yet I gather no definite resolution has been taken in the matter, but circulars signed "John Jones," and dated from 7 Victoria Chambers, Westminster, were sent out to the leading houses some time back. A meeting will, however, be held at the Westminster Palace Hotel at two o'clock on Tuesday next, at which something definite may be arrived at. Nearer home I hear of one or two interesting and important movements which will very shortly be to the fore, but being at present in an embryo state I cannot touch upon them more fully without committing a breach of confidence. I may state, however, that one object in contemplation is the removal of certain disadvantages under which the district is laboring as compared with other localities with which it is in active competition.

Pig iron of all descriptions has been well maintained in price, the following being the nominal current quotation for hematite pigs: Mutton Bessemer, No. 1, 80; No. 2, 77 1/2; No. 3, 75 1/2; ordinary, No. 3, 72 1/2; No. 4, 71 1/2; No. 5, 71 1/2; mottled, 80; and white, 80 per ton. Mutton hematite, No. 3, 72 1/2; No. 4, 72 1/2; No. 5, mottled and white, 72 1/2; Bessemer, No. 1, 80; No. 2, 77 1/2; No. 3, 75 1/2; per ton less, 2 1/2 per cent. for cash.
House coal has again gone up to the extent of 1/2 or thereabouts per ton, and hard coal is firm in price, although it is not officially more

than six pence per ton dearer. The main subject of interest in the district during the past ten days has been the dreadful explosion at the Swallow Main Colliery, its dire effects and its possible cause. The inquiry has been opened for the purpose of identification, and some important evidence has been given. The government has been instructed Mr. Maule, Q. C., to watch the proceedings on their behalf—and if—as is at present supposed—the explosion took place owing to the firing of a blasting shot, it is assumed that an Act will be passed, altogether prohibiting blasting in mines during the time the men are at work. Up to the present time there have been about 137 bodies recovered, and it is believed that there are about ten others in the workings. The government inspector and other gentlemen are engaged in making an official inspection of the whole of the pit.

The entries trade are just now pretty fairly engaged, but there is not that incessant day and night work which commonly characterizes the three weeks or month prior to the Christmas holidays.

BIRMINGHAM AND SOUTH STAFFORDSHIRE.
These districts, in common with others, have experienced no alteration worthy of special mention since I last wrote. Ordinary common bars range from £8 to £9, and best are £10 to £10 12 1/2. Singles sheets are on offer in any quantity at £11 to £11 5. Pig iron is steady, notwithstanding the close competition with the Yorkshire and North Country houses. At neither of the weekly change meetings held at Wolverhampton and Birmingham was there any amount of business done, it being readily apparent that there is weekly less trade doing in South Staffordshire. I quote the following report of the district hardware industries from a Birmingham paper:

"Brazil, the Spanish West Indies and Mexico are good customers just now for edge tools, tinware, metallic bedsteads and other specialties. As regards the home trade, factors' and manufacturers' travelers having now, for the most part, completed their journeys, there are few orders coming in."

Manufacturers generally are well occupied still on old orders, which include several important government and railway contracts for tools, naval and dockyard ironwork, war material, boiler tubes, nuts, bolts, and spikes and saddlery, etc. The brass foundry trades are all in full operation, chiefly on home account. In the tin plate branch, lamps, lanterns, tea trays, trunks, grocers' canisters, molds and dish covers are in special request. Enamelled iron goods are also in improving demand. There is not quite so much activity in the home demand for brass and iron bedsteads, but shipping orders for this class of goods have been, and continue, very satisfactory, especially for Spain, Cuba, and some of the principal South American markets. The jewelry trade, though certainly better than it has been, is for this season of the year, decidedly dull; perhaps more so than for several years. Complaints are very general among the makers of medium and better class goods. Australian and other foreign orders by several recent mails have been exceedingly few and poor. Reports of the electro plate trade are to the effect that there is considerable activity, as usual at this period of the year, as shopkeepers are anxious to get a good display of goods at Christmas, and manufacturers are pushing all orders in before the holidays. There is also a fair sprinkling of foreign orders about. The tinware and other button trades are very quiet, and there is not expected to be any activity until the spring. The edge tool trades continue brisk, and a fresh and considerable distribution of orders for road making tools, on account of the Indian government, has, we understand, taken place within the last few days. The tools most in request are picks, and the port of destination is Calcutta. Steel pen manufacturers are all very busy, and there is no lack of employment in the fancy trades of the town."

SOUTH WALES.
Reports from South Wales are again anything but cheering, and they do not speak of the prospects of the principality in hopeful tones. In fact, it is stated that thousands of ironworkers who had been to the North of England in search of work have returned to their Welsh homes dispirited, and, unluckily, with home prospects worse than when they started off. The Bleanaw Iron Company has just reopened its tire mills, which had been closed for a long time. The time of the concern at one time had a considerable reputation.

THE METAL MARKETS.
opened with some little animation on Monday last; 100 tons of Chili Bars changed hands at £81 7/6 to £81 10/6, and Australian was 10/ dearer. In tin, too, more was done, 60 tons of Straits at £81 to £81 10/6. Lead participated in the general improvement, £22 5/2 to £22 10/6. On Tuesday 50 tons Urmetta Bars sold at £81 10/6, cash, and Wallaroo, £90 10/6. In tin there was a slight relapse in prices, and less business doing. On Wednesday the markets were irregular, and no business recorded, except 25 tons Chili Bars at £81 10/6. On Thursday information as to the charters for first half of December was sent to the effect that the effect of the good sales of Chili Bars at £82, as well as an improve of 10 in Australian. On Friday this renewed steadiness was well maintained.

Messrs. Von Dadelzen & North report: "Copper—Early in the week the market was flat, and several lots of Chili Bars were sold as low as £80 and £80 5/2, but the price gradually improved to £81 10/6, and when yesterday the market for first fortnight of December was telegraphed as only 1400 tons, a further advance of 10 per ton took place, and the price closed at £82. Wallaroo remains nominally at £90 to £90 10/6, and Burma, £89, English dull. Tin.—Very little alteration to report in this metal. The market is, if anything, better than a week ago. Straits has changed hands from £81 10/6 to £82, and closes at these figures. Australian, £80 10/6 to £81. The Dutch market remains quiet, but dull. English blocks, £85. Tin Plates.—The demand has not increased, and the manufacturers have given notice of a reduction of 20 per cent. in wages, from the first of January next, and it remains to be seen whether the men will accept this without further complications. Lead.—In fair demand, from £22 5/2 to £22 7/6, for quick delivery. Spelter.—The price remains firm for Silesian, but there is hardly any business officially reported. We quote good ordinary brand £25 5/2 to £25 10/6. Quicksilver.—The importer declines to name a price, but second hand parcels have been sold, in moderate quantities, from £11 to £11 10/6, per bottle."

The Mining Journal remarks: "Copper.—At the beginning of the week the market was firm, and business was reported in Chili bars g. o. b., £81 7/6 to £81 10/6. Burma changed hands at £80, and there were buyers of Wallaroo at £90. English tinned is quoted £86 to £87; best selected, £88; India sheets, 4 by 4, £90; strong sheets, £94 to £95; and yellow metal, 7 1/4 to 8 1/4. Up to Thursday the market was firm, but rather less doing than at the commencement; but on Thursday the charters for the first fortnight in December were announced to be 1400 tons. This intelligence imparted increased activity to the market, and 200 tons of Chili bars g. o. b. were reported to have changed hands at £81 10/6 to £82, usual cash terms. To-day 50 tons changed hands at £82. Lead.—

The market has continued firm, and sellers are now declining to enter into contracts at current rates. Good soft English pig is quoted £22 7/6 to £23 10/6, and soft Spanish, without silver, £23 12 1/2 to £24 1/2, according to delivery. Spelter.—The market continues steady, and Silesian is quoted £25 5/2 to £25 10/6. Zinc.—A small parcel of zinc, London rolled, realized £22 10/6. Quicksilver.—The market is nominal, and quotations stand at £11 15/6 to £11 17 1/2. Tin.—At the beginning of the week the market presented a firm appearance, and business was done on a large scale. Straits was sold at £81 15/6 to £82 10/6, cash, and Australian up to £81 10/6, cash, and £79 10/6, distant arrival. On Tuesday the market was quiet, but on Wednesday it assumed greater activity, and various parcels changed hands at irregular prices. Thursday's market was steadier, and business was done in Straits at £81 to £81 10/6, cash, and in Australian at £80 5/2 to £80 10/6, cash. To-day the market is quiet, closing with a downward tendency. Straits, £81; Australian, £80 10/6. Tin Plates in fair demand. Prices, for the most part, remain unaltered.

Messrs. Sandford & Bird's prices current, December 15: "Tin Plates.—Makers are very fairly well off for orders, and prices are well maintained. Melyn Charcoal, I. C., 28, per box; Afan, I. C., 26; Cymro Coke, I. C., 24; Best Charcoal, I. C., 28 to 30; Charcoal, I. C., 25 6 to 26 4; Best Coke, I. C., 24 to 25; Coke, I. C., 22 6 to 23; Terne Plates, I. C., 30; Black Plate, I. C., 17 6 per cent.; Black Ingots, 112 lbs., 30 per box; Charcoal Tinned Sheets, 40 per cent.; Coke Tinned Sheets, 37 per cent.; Continuous Tine Roofing, 80 per keg."

Messrs. Harrington, Horan & Co. (Liverpool), reported on December 15: "On the departure of the last mail, Chili Bars were selling at £81 per ton, and after declining to £80, a rally took place, and up to £81 10/6 was paid for good ordinary bars, and £82 10/6 for best brands, at which rate the market is now firm. Chili furnace material is neglected, owing to the comparatively high prices asked for it by importers. By advices from Valparaiso we learn that Copper Charters for the fortnight ending first instant were 2500 tons fine, composed of 1550 tons Bars and Ingots, and 250 tons Ore and 1 Regulus for England, and 800 tons Bars for France. During the fortnight consumers have taken about 1800 tons Bars at £80 to £82, 10 per ton, and at the Swansea sale, by tender on the 7th instant, 1411 tons Ore, average produce 10 1/2 per cent., realized 15 9 per unit. Cape Ore selling at 10 6 per unit. Quotations are to-day: Chili Bars, £81 to £83; do. Ingots, £90; do. Ore and Regulus, 16 6 to 17; Coro Coro Barilla, 18."

Latest Liverpool prices are:

Iron: f. o. b. in Liverpool, per ton.	£	s.	d.	£	s.	d.
Merchant bar,	7	15	0	7	10	0
Merchant bar, in Wales,	7	5	0	7	10	0
Staffordshire,	8	5	0	11	15	0
Hoop,	9	10	0	10	15	0
Sheet,	11	10	0	11	15	0
Nail rod,	8	10	0	9	0	0
Bar, best,	5	0	0	15	0	0
Boiler plates,	10	10	0	12	0	0

Tin Plates: f. o. b. in Liverpool, per box.

	£	s.	d.	£	s.	d.
Charcoal, I. C.....	1	6	0@	1	8	0
Coke, I. C.....	1	2	0@	1	4	0

Copper: Delivered in Liverpool, per ton.

Bolt and Sheathing,	£	s.	d.	£	s.	d.
Tin,	97	0	0	0	0	0
Tile,	90	0	0	0	0	0
Touch cake,	90	0	0	0	0	0
Best selected,	92	0	0	0	0	0

The Iron Trade in 1875.

Messrs. Edward Samuel & Co., of Philadelphia, send us the following review of the past year:

FIG IRON.
In this market for the past year has been handled in small parcels, excepting in sales made to the pipe foundries, who have been the principal consumers of No. 2 and No. 3. Prices were remarkably steady from January to July, since which time they have been on a descending scale, and now sales of standard makes of Nos. 2 and 3 are quoted at £20 and £18, currency, f. o. b. cars at the furnace, or, at the present gold premium of 15 per cent., equal to £17 10 and £15 15 in gold, figures which, since 1842 have only been reached in years of the greatest depression of our trade, to wit: 1849, 1850, 1851 and until July of 1853, and again for a short period in 1861. Looking at the past, the only natural conclusion that can be drawn is that the present prices are too low, and that the reaction is but a question of time. It is uniformly conceded that a rapid rise would be as injurious in the end as the present condition of affairs, and it is therefore to be hoped that the change will be gradual. The production of pig for the last twelve months has been, considering the limited demand, unprecedentedly large, and the continued weakening of prices must be attributed more to this fact than to any other. The warehousing and warrant system, introduced about a year ago, has not resulted in the complete success expected by its projectors, but enough has been done to warrant the continuance of the business, and we have no doubt that before long the advantages and security of warrants, especially at the present low prices of metal, will be appreciated by capitalists and bankers. Below we give the estimated stocks of pig iron on hand in the different districts, in gross tons.

ESTIMATED STOCK OF ANTHRACITE FIG IRON ON HAND.

	Dec. 7 Dec. '75, Inc.	Dec. 7 Dec. '75, Inc.	Dec. 7 Dec. '75, Inc.	Dec. 7 Dec. '75, Inc.
Leligh Valley, inclusive of the Jersey Group,	35,000	51,000	25,000	...
Schuykill,	36,000	61,000	24,000	...
Lower Susquehanna,	10,000	25,000	15,000	...
Upper Susquehanna,	10,000	25,000	15,000	...
Shenandoah & Mahoning Valleys, Bituminous Coal and Coke,	109,000	34,000	61,000	...

In Charcoal Pig Metal, the stock on hand at the close of last year aggregated at least 275,000 gross tons for the entire country, and prices have consequently been much depressed the year through. The stocks have been considerably reduced by consumption, and the low prices prevailing have prevented a large number of stocks from continuing operations. About £32 per ton is the selling price of good makes, although some few of superior quality for specialties are being sold at £35, and others of inferior or unknown make are selling as low as £

DOTY'S REVOLVING

TRADE MARK.

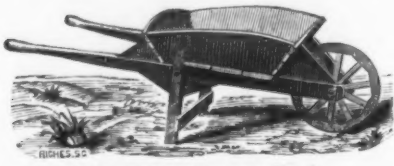


ROAD SCRAPERS.

There are now in use in the United States and Canada 25,000 Scrapers of our manufacture on Railroads, Turnpikes, Farms, and Canals, and the demand is still increasing. It is an indisputable fact that those who have ever used the Revolving Scraper never use any other afterwards. Experience proves them the **Best and Cheapest**.

TRY THEM.

SELF-OILING WHEEL.



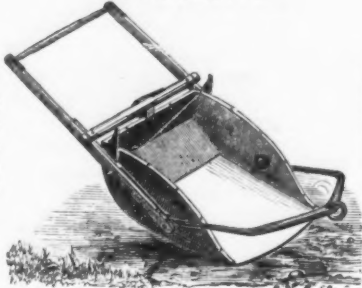
One and Coal Barrow No. 1.

with our patent Self-Oiling Wheel and Corner Locked Body, made from thoroughly seasoned hard timber, makes it the **Strongest and Cheapest** Barrow for the purpose in the market.

DOTY'S MAMMOTH HARD PAN PLOW.

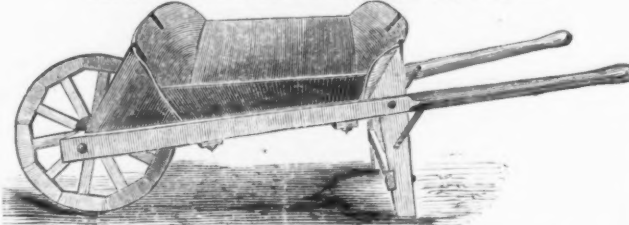
This is the largest plow made in the West. It is made from the best cast steel, and will stand the strength of ten horses.

AUTOMATIC



SCRAPER.
Certificates from hundreds of Railroad and Canal Contractors prove that the DOTY Scraper is the **BEST**.

R. R. and CANAL BARROW, No. 2.



We offer this barrow to the trade with our patent self oiling wheel as the best barrow ever made for R. R. and Canal work.

HAVE YOU SEEN IT?

WE WARRANT EVERY WHEEL.

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REVOLVING SCRAPER CO., Room 5, Deshler Building, Columbus, O.

production of this year (considering the smaller demand) has held over the market a large unsold balance which has had a most depressing effect. There has been but slight trouble with labor during the year, the only strike of any duration being that of the puddlers in Pittsburgh, and this was eventually compromised by concessions on both sides. In the East the hands have generally accepted all fair reductions asked by the employers without trouble. That a much larger consumption of iron has not occurred is not so much due to the fact that it was not wanted, but because a general want of confidence has existed, especially in new railroad enterprises, which practically prevented business. Could this element of uncertainty be removed, the volume of business would expand immensely; but it requires time, and time only, to cure this. It is undoubtedly the fact that the trade is today in a better position than a year ago, although prices are nominally lower, and demand at present at a standstill; but this latter is generally the case at this time of the year, most of the large purchasers having taken advantage of water transportation a month since.

Without attempting to predict for so uncertain a future, we can at least safely state that prices are very near bottom.

Very truly,
EDWARD SAMUEL & CO.

The Origin and Progress of Engineering Science.

(Continued.)

In the science of astronomy, which in these days is making such marvelous discoveries, Chaldea was undoubtedly pre-eminent. Among the many relics of these ancient peoples which Mr. Smith has recently brought to this country, is a portion of a metal astrolabe from the palace of Sennacherib, and a tablet on which is recorded the division of the heavens according to the four seasons, and the rule for regulating the intercalary month of the year. Not only did the Chaldeans map out the heavens and arrange the stars, but they traced the motion of the planets, and observed the appearance of comets; they fixed the signs of the zodiac, and they studied the sun and moon and the periods of eclipses.

But to return to that branch of knowledge to which I wish more particularly to draw your attention, as it grew and spread from East to West, from Asia over Europe. Of all nations of Europe the Greeks were most intimately connected with the civilization of the East. A maritime people by the nature of the land they lived in, colonization followed as a matter of course on the tracks of their trading vessels; and thus, more than any other people, they helped to spread Eastern knowledge along the shores of the Mediterranean, and throughout the shores of Europe.

The early constructive works of Greece, till about the seventh century B. C., form a strong contrast to those of its more prosperous days. Commonly called Pelasgian, they are more remarkable as engineering works than admirable as those which followed them were for architectural beauty. Walls of huge unshaped stones—admirably fitted together, however—tunnels and bridges characterize this period.

In Greece, during the few and glorious centuries which followed, the one aim in all construction was to please the eye, to gratify the sense of beauty; and in no age was that aim more thoroughly and satisfactorily attained.

In these days, when sanitary questions attract each year more attention, we may call to mind that 23 centuries ago the city of Agrigentum possessed a system of sewers, which, on account of their large size, were thought worthy of mention by Diodorus. This is not, however, the first record of towns being drained; the well known Cloaca Maxima, which formed part of the drainage system of Rome, was built some two centuries earlier, and great vaulted drains passed beneath the palace mounds of unburnt brick at Nimrod and Babylon; and, possibly, we owe the preservation of many of the interesting remains found in the brick mounds of Chaldea to the very elaborate system of pipe drainage discovered in them and described by Loftus.

Whilst Pelasgian art was being superseded in Greece, the city of Rome was founded in the eighth century before our era; and Etruscan art in Italy, like the Pelasgian art in Greece, was slowly merged into that of an Aryan race. The Etruscans, like the Pelasgians and the old Egyptians, were Turanians, and remarkable for their purely constructive or engineering works. Their city walls far surpass those of any other ancient race, and their drainage works and tunnels are most remarkable.

The only age which can compare with the present one in the rapid extension of utilitarian works over the face of the civilized world is that during which the Romans—an Aryan race, as we are—were in power. As Ferguson has said, the mission of the Aryan races appears to be to pervade the world with useful and industrial arts. That the Romans adorned their bridges, the aqueducts, and their roads; that with a sound knowledge of construction they frequently made it subservient to decoration, was partly owing to the mixture of Etruscan or Turanian blood in their veins, and partly to their great wealth, which made them disregard cost in their construction, and to their love of display.

It would be impossible for me to do justice to even a small part of the engineering works which have survived 14 centuries of strife, and remain to this day as monuments of the skill, the energy and ability of the great Roman people. Fortunately, their works are more accessible than those of which I have spoken hitherto, and many of you are probably already familiar with them.

Conquerors of the greater part of the civilized world, the admirable organization of the Romans enabled them to make good use of the unbounded resources which were at their disposal. Yet, while the capital was enriched, the development of the resources of the most distant provinces of the empire was never neglected.

War, with all its attendant evils, has often indirectly benefited mankind. In the long

sieges which took place during the old wars of Greece and Rome, the inventive power of man was taxed to the utmost to provide machines for attack and defence. The ablest mathematicians and philosophers were pressed into the service, and helped to turn the scale in favor of their employers. The world has to regret the loss of more than one who, like Archimedes, fell slain by the soldiery while applying the best scientific knowledge of the day to devising means of defence during the siege. In these days, too, science owes much to the labors of engineers and able men, whose time is spent in making and improving guns, the materials composing them, and armor plates to resist them, or in studying the motion of ships of war in a seaway.

The necessity for roads and bridges for military purposes has led to their being made where the necessary stimulus from other causes was wanting; and so, means of communication, and the interchange of commodities, so essential to the prosperity of any community, have thus been provided. Such was the case under the Roman Empire. So, too, in later times the ambition of Napoleon covered France and the countries subject to her with an admirable system of military roads. At the same time, we must do Napoleon the justice of saying that his genius and foresight gave a great impetus to the construction of all works favorable to commercial progress. So, again, in this country it was the rebellion of 1745, and the want felt of roads for military purposes, which first led to the construction of a system of roads in it unequalled since the time of the Roman occupation. And lastly, in India, in Germany and in Russia more than one example could be pointed out where industry will benefit by railways which have originated in military precautions rather than in commercial requirements.

But to return to Rome. Roads followed the tracks of her legions into the most distant provinces of the empire. Three hundred and seventy-two great roads are enumerated, together more than 48,000 miles in length, according to the Itinerary of Antoninus.

The water supply of Rome during the first century of our era would suffice for a population of 7,000,000, supplied at the rate at which the present population of London is supplied. This water was conveyed to Rome by nine aqueducts; and in later years the supply was increased by the construction of five more aqueducts. Three of the old aqueducts have sufficed to supply the wants of the city in modern times. These aqueducts of Rome are to be numbered among her grandest engineering works. Time will not admit of my saying anything about her harbor works and bridges, her basilicas and baths, and numerous other works in Europe, in Asia and in Africa. Not only were these works executed in a substantial and perfect manner, but they were maintained by an efficient staff of men divided into bodies, each having their special duties to perform. The highest officers of state superintended the

construction of works, were proud to have their names associated with them, and constructed extensive works at their own expense.

Progress in Europe stopped with the fall of the Roman Empire. In the fourth and succeeding centuries the barbarous hordes of Western Asia, people who felt no want of roads and bridges, swept over Europe to plunder and destroy.

With the seventh century began the rise of the Mohammedan power, and a partial return to conditions apparently more favorable to the progress of industrial art, when widespread lands were again united under the sway of powerful rulers. Science owes much to Arab scholars, who kept and handed on to us the knowledge acquired so slowly in ancient times, and much of which would have been lost but for them. Still, few useful works remain to mark the supremacy of the Mohammedan power at all comparable to those of the age which preceded its rise.

A great building age began in Europe in the tenth century, and lasted through the thirteenth. It was during this period that these great ecclesiastical buildings were erected, which are not more remarkable for artistic excellence than for boldness in design.

While the building of cathedrals progressed on all sides in Europe, works of utilitarian character, which concern the engineer, did not receive such encouragement, excepting perhaps in Italy.

From the twelfth to the thirteenth centuries, with the revival of the arts and sciences in the Italian republics, many important works were undertaken for the improvement of the rivers and harbors of Italy. In 1481 canal locks were first used; and some of the earliest of which we have record were erected by Leonardo da Vinci, who would be remembered as a skillful engineer had he not left other greater and more attractive works to claim the homage of posterity.

The great use that has since been made of this simple means of transferring floating vessels from one water level to another, in connection not only with inland navigation, but in all the great ports and harbors of the world, renders it all the more deserving of remark.

In India, under the Moguls, irrigation works, for which they had a natural aptitude, were carried on during these centuries with vigor, and more than one emperor is noted for the numerous great works of this nature which he carried out. If the native records can be trusted, the number of hydraulic works undertaken by some rulers is surprising. Tradition relates that one king who reigned in Orissa, in the twelfth century, made one million tanks or reservoirs, beside building sixty temples, and erecting numerous other works.

In India, the frequent overflow of the great rivers, and the periodical droughts which rendered irrigation necessary, led to extensive protective works being undertaken at an early period; but as these works have been maintained by successive rulers, Mogul and Moham-

medan, until recent times, and have not been left for our inspection, deserted and useless for 3000 years or more, as is often the case in Egypt and Mesopotamia, there is more difficulty in ascertaining the date of such works in India.

Works of irrigation were among the earliest attempts at engineering undertaken by the least civilized inhabitants in all parts of the world. Even in Australia, where savages are found as low as any in the scale of civilization, traces of irrigation works have been found; these works, however, must be taken to show that the natives were once somewhat more civilized than we now find them. In Feejee, our new possession, the natives occasionally irrigate their land, and have executed a work of a higher class, a canal some two miles long and sixty feet wide, to shorten the distance passed over by their canoes. The natives of New Caledonia irrigate their fields with great skill. In Peru, the Incas excelled in irrigation as in other great and useful works, and constructed most admirable underground conduits of masonry for the purpose of increasing the fertility of the land.

It is frequently easier to lead water where it is wanted than to check its irruption into places where its presence is an evil, often a disaster. For centuries the existence of a large part of Holland has been dependent on the skill of man. How soon he began in that country to contest with the sea the possession of the land we do not know, but early in the twelfth century dykes were constructed to keep back the ocean. As the prosperity of the country increased with the great extension of its commerce, and land became more valuable and necessary for an increasing population, very extensive works were undertaken. Land was reclaimed from the sea, canals were cut, and machines were designed for lifting water. To the practical knowledge acquired by the Dutch, whose method of carrying out hydraulic works is original and of native growth, much of the knowledge of the present day in embanking, and draining and canal making is due. The North Holland Canal was the largest navigable canal in existence until the Suez Canal was completed; and the Dutch have just now nearly finished making a sea canal from Amsterdam to the North Sea, which, though not equal to the Suez Canal in length, will be as great in width and depth, and involves perhaps larger and more important works of art. This country was for many years beholden to the Dutch for help in carrying out hydraulic works. In the seventeenth century much fen land in the eastern counties was drained by Dutch labor, directed by Dutch engineers, among whom Sir Cornelius Vermuyden, an olden campaigner of the Thirty Years' War, and a colonel of horse under Cromwell, is the most noted.

(To be continued.)

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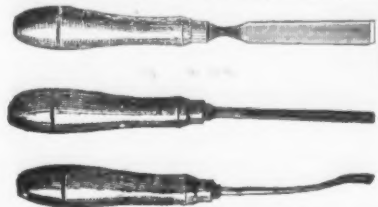
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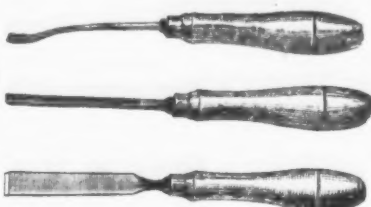
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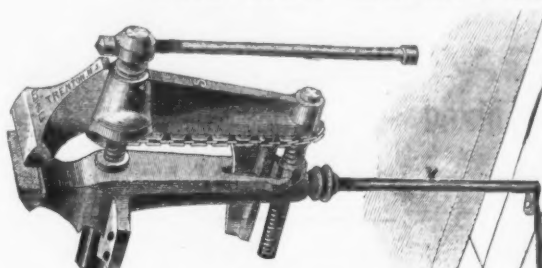


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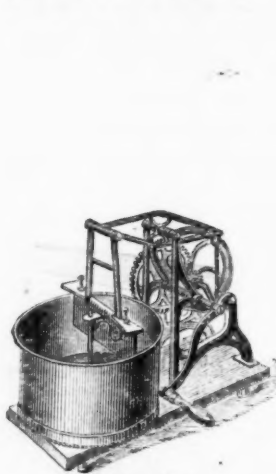
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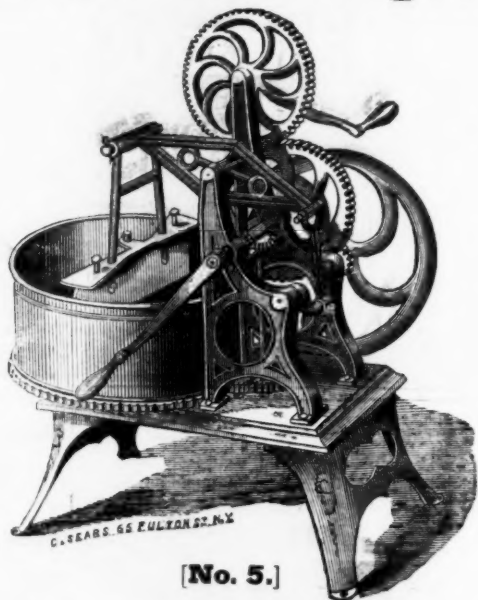
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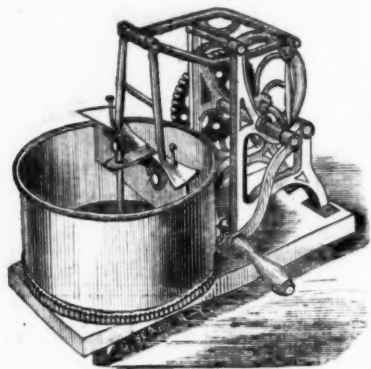
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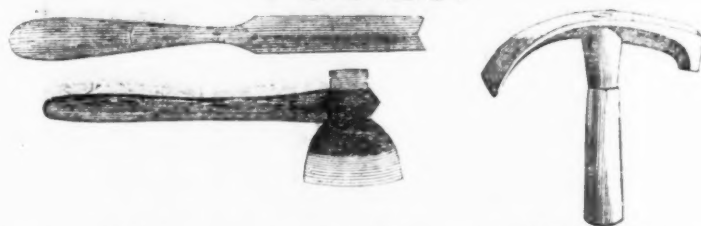
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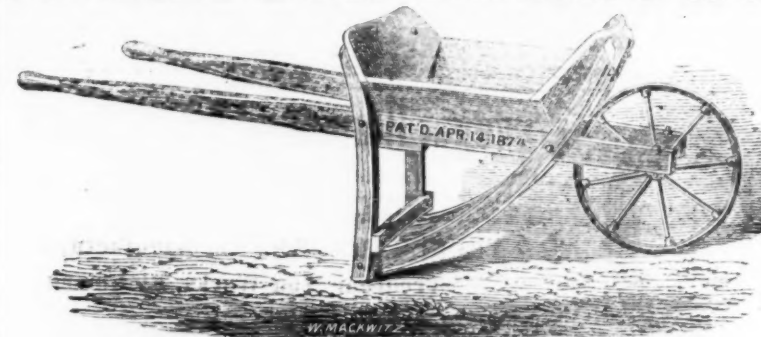


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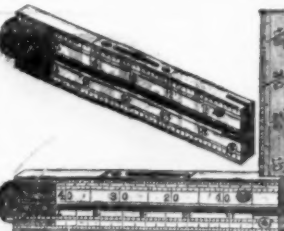
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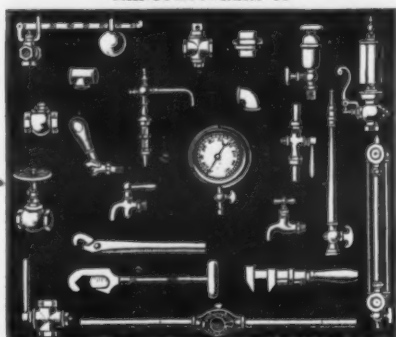
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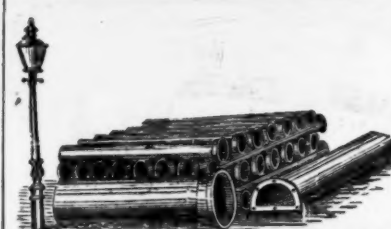
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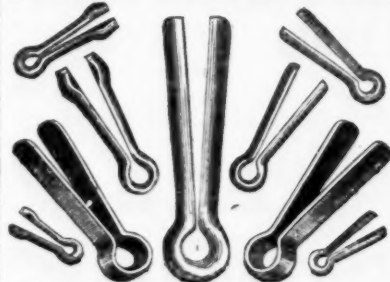
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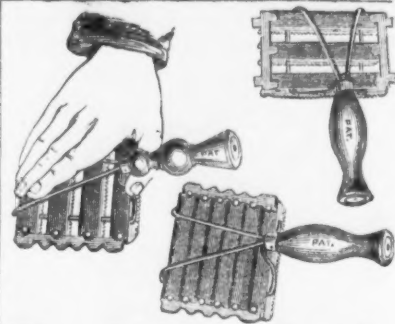
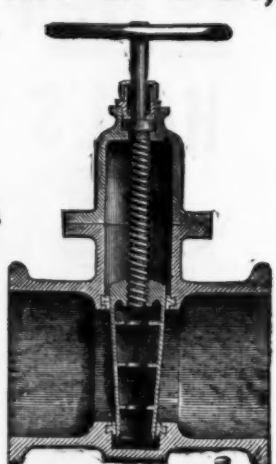
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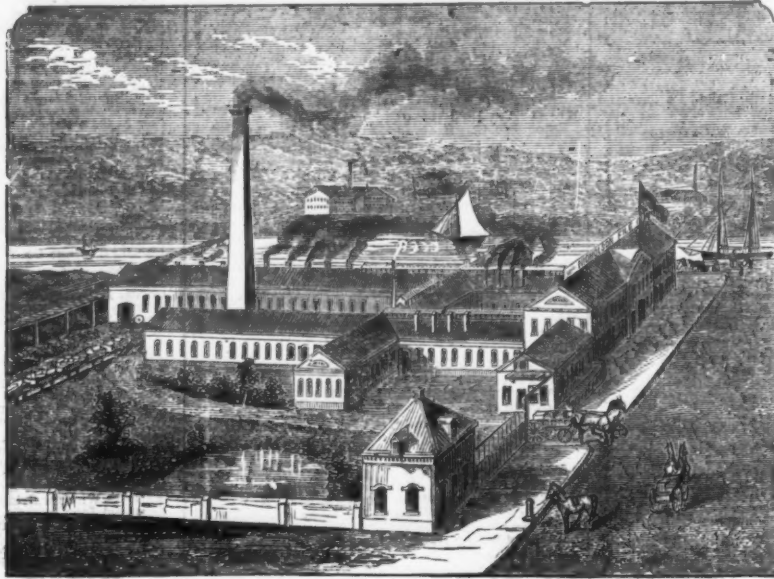
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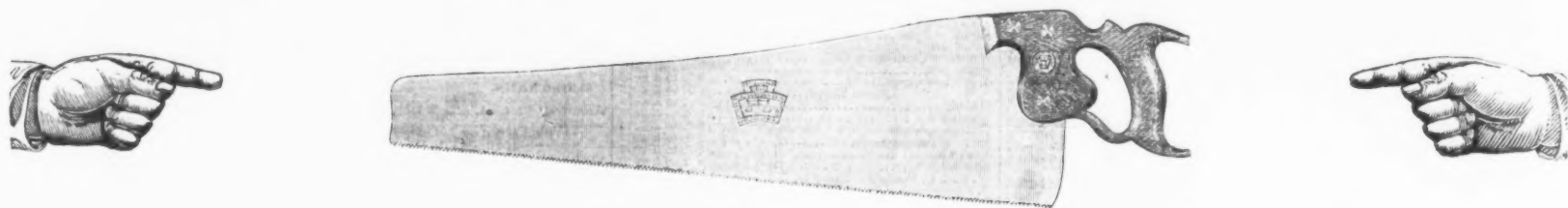
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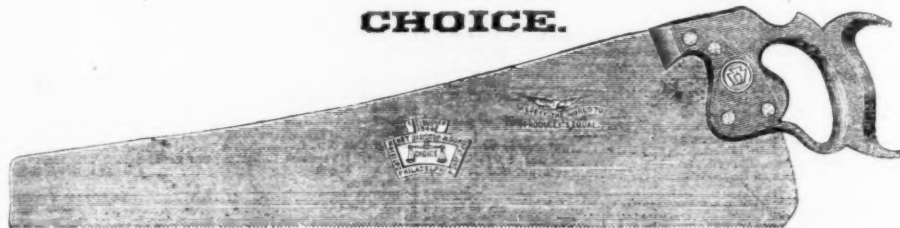
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November, 1875.

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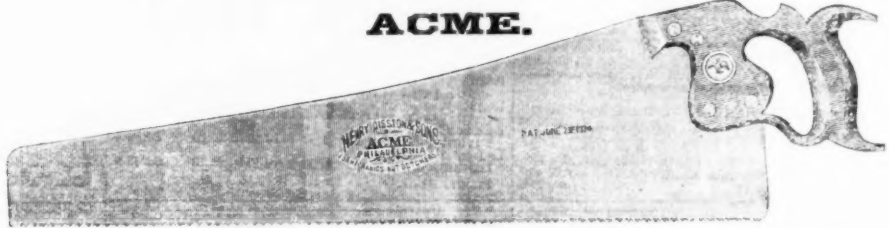
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This Saw is the "CHOICE" of all first-class Mechanics who have used it.

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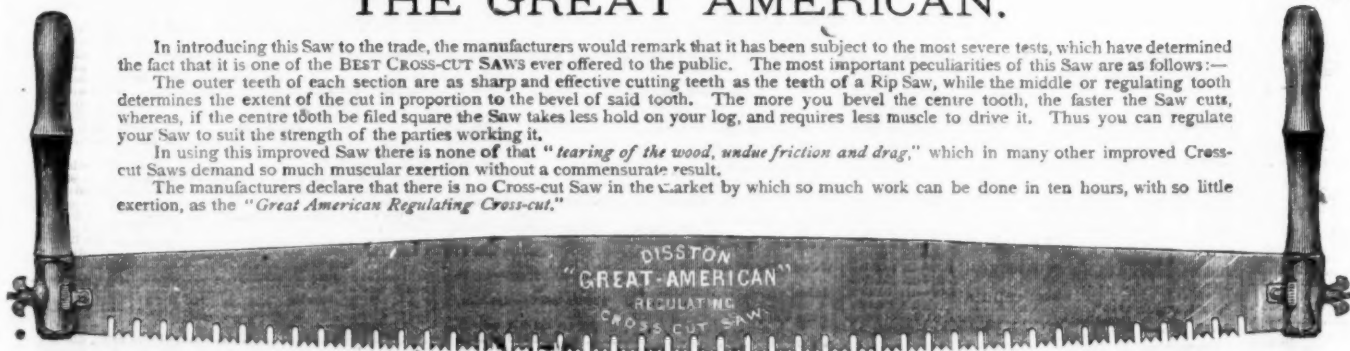
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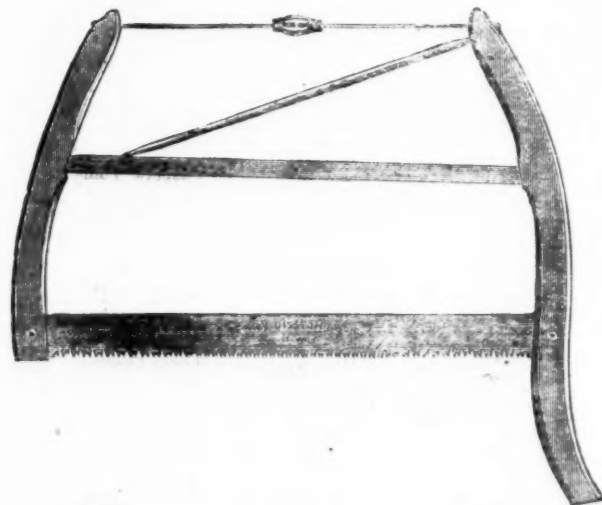
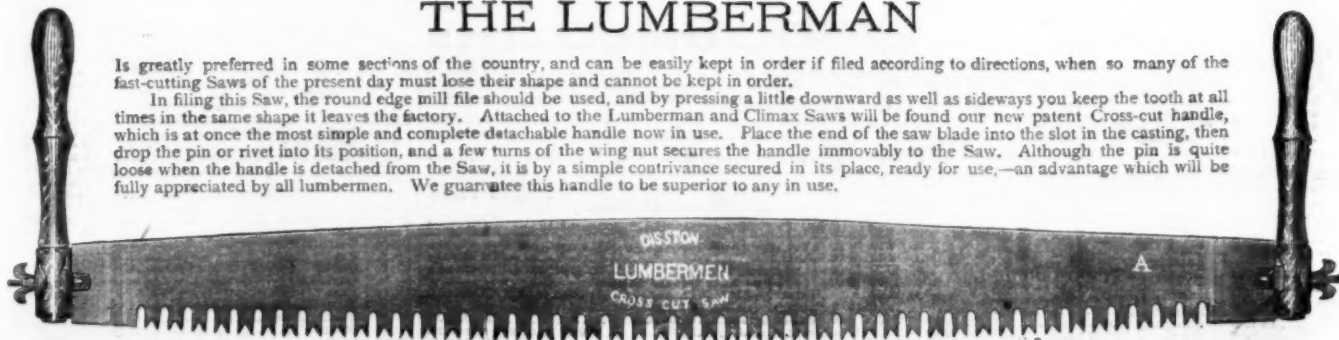
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "Great American Regulating Cross-cut."



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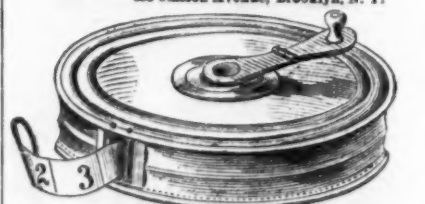
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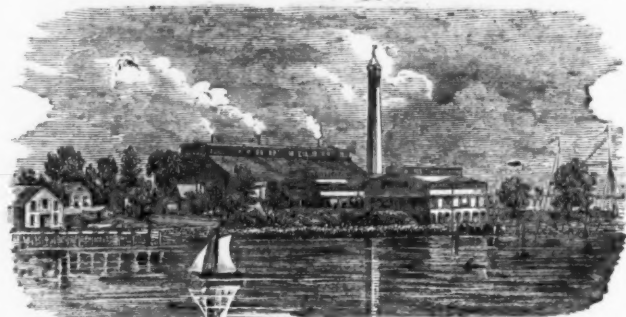
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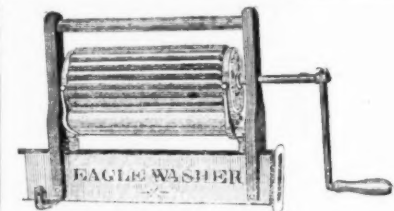
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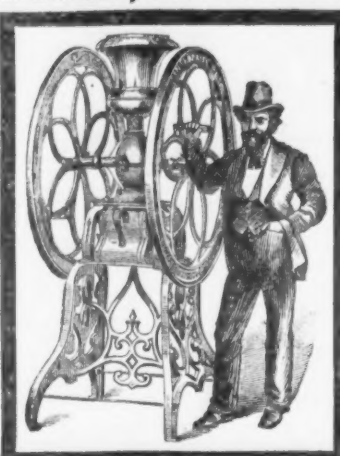
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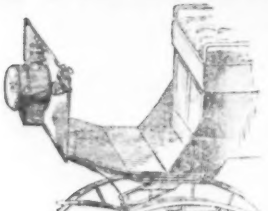
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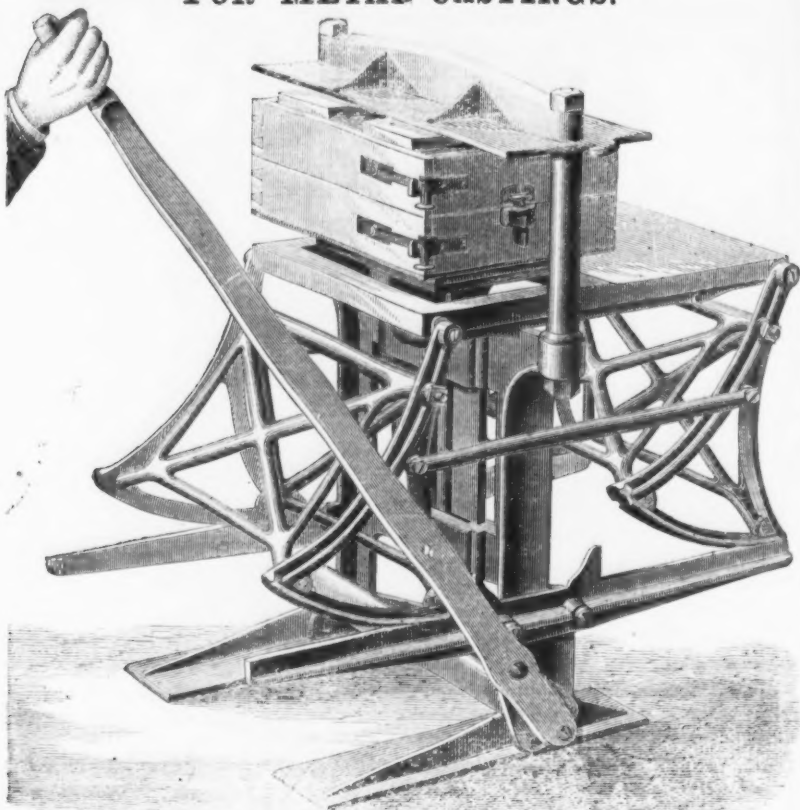
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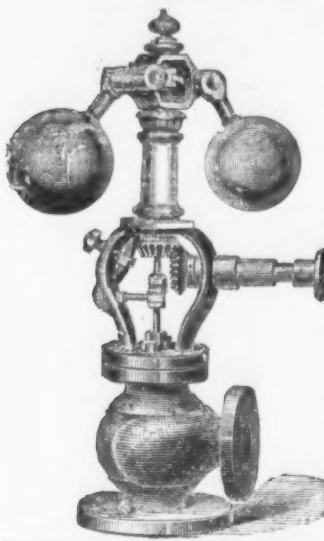
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Diamond Solid Emery Wheel

Prices: 10x1, \$2.50; 11x2, \$3.75; 12x2 1/2, \$5.00; 14x3, \$7.50; 16x4, \$10.00; 18x5, \$12.50; 20x6, \$15.00; 24x8, \$20.00; 30x10, \$25.00; 36x12, \$30.00; 42x14, \$35.00; 48x16, \$40.00; 54x18, \$45.00; 60x20, \$50.00; 72x24, \$60.00; 84x28, \$70.00; 96x32, \$80.00; 108x36, \$90.00; 120x40, \$100.00; 144x48, \$120.00; 168x56, \$140.00; 192x64, \$160.00; 216x72, \$180.00; 240x80, \$200.00; 264x88, \$220.00; 288x96, \$240.00; 312x104, \$260.00; 336x112, \$280.00; 360x120, \$300.00; 384x128, \$320.00; 408x136, \$340.00; 432x144, \$360.00; 456x152, \$380.00; 480x160, \$400.00; 504x168, \$420.00; 528x176, \$440.00; 552x184, \$460.00; 576x192, \$480.00; 600x200, \$500.00; 624x208, \$520.00; 648x216, \$540.00; 672x224, \$560.00; 696x232, \$580.00; 720x240, \$600.00; 744x248, \$620.00; 768x256, \$640.00; 792x264, \$660.00; 816x272, \$680.00; 840x280, \$700.00; 864x288, \$720.00; 888x296, \$740.00; 912x304, \$760.00; 936x312, \$780.00; 960x320, \$800.00; 984x328, \$820.00; 1008x336, \$840.00; 1032x344, \$860.00; 1056x352, \$880.00; 1080x360, \$900.00; 1104x368, \$920.00; 1128x376, \$940.00; 1152x384, \$960.00; 1176x392, \$980.00; 1200x400, \$1000.00; 1224x408, \$1020.00; 1248x416, \$1040.00; 1272x424, \$1060.00; 1296x432, \$1080.00; 1320x440, \$1100.00; 1344x448, \$1120.00; 1368x456, \$1140.00; 1392x464, \$1160.00; 1416x472, \$1180.00; 1440x480, \$1200.00; 1464x488, \$1220.00; 1488x496, \$1240.00; 1512x504, \$1260.00; 1536x512, \$1280.00; 1560x520, \$1300.00; 1584x528, \$1320.00; 1608x536, \$1340.00; 1632x544, \$1360.00; 1656x552, \$1380.00; 1680x560, \$1400.00; 1704x568, \$1420.00; 1728x576, \$1440.00; 1752x584, \$1460.00; 1776x592, \$1480.00; 1800x600, \$1500.00; 1824x608, \$1520.00; 1848x616, \$1540.00; 1872x624, \$1560.00; 1896x632, \$1580.00; 1920x640, \$1600.00; 1944x648, \$1620.00; 1968x656, \$1640.00; 1992x664, \$1660.00; 2016x672, \$1680.00; 2040x680, \$1700.00; 2064x688, \$1720.00; 2088x696, \$1740.00; 2112x704, \$1760.00; 2136x712, \$1780.00; 2160x720, \$1800.00; 2184x728, \$1820.00; 2208x736, \$1840.00; 2232x744, \$1860.00; 2256x752, \$1880.00; 2280x760, \$1900.00; 2304x768, \$1920.00; 2328x776, \$1940.00; 2352x784, \$1960.00; 2376x792, \$1980.00; 2400x800, \$2000.00; 2424x808, \$2020.00; 2448x816, \$2040.00; 2472x824, \$2060.00; 2496x832, \$2080.00; 2520x840, \$2100.00; 2544x848, \$2120.00; 2568x856, \$2140.00; 2592x864, \$2160.00; 2616x872, \$2180.00; 2640x880, \$2200.00; 2664x888, \$2220.00; 2688x896, \$2240.00; 2712x904, \$2260.00; 2736x912, \$2280.00; 2760x920, \$2300.00; 2784x928, \$2320.00; 2808x936, \$2340.00; 2832x944, \$2360.00; 2856x952, \$2380.00; 2880x960, \$2400.00; 2904x968, \$2420.00; 2928x976, \$2440.00; 2952x984, \$2460.00; 2976x992, \$2480.00; 3000x1000, \$2500.00; 3024x1008, \$2520.00; 3048x1016, \$2540.00; 3072x1024, \$2560.00; 3096x1032, \$2580.00; 3120x1040, \$2600.00; 3144x1048, \$2620.00; 3168x1056, \$2640.00; 3192x1064, \$2660.00; 3216x1072, \$2680.00; 3240x1080, \$2700.00; 3264x1088, \$2720.00; 3288x1096, \$2740.00; 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A.....	14c	In sheets, 1c higher.	
Lead,---		Lead Pipe, in full coils.	8½c
Pig.....	7½c	Lead Pipe, when cut.	8½c
Bar.....	8½c	Sheet Lead.	9½c
Wire—Bright.			
Coppered.....			dis 20



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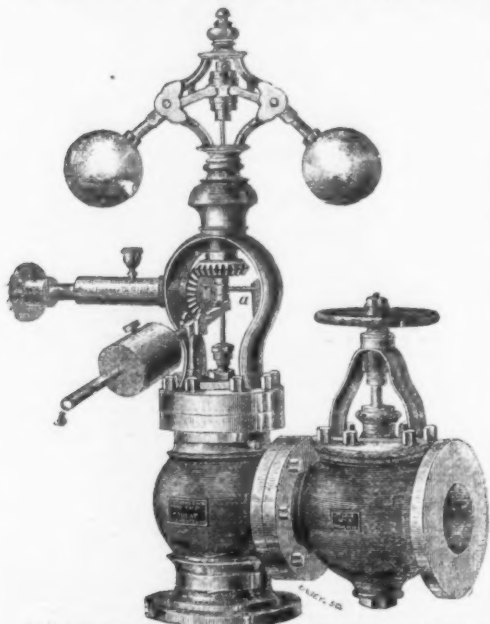
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Capacity of Valve or Diameter of Steam Pipe in inches.	Price, Black.	Price, Bright Finish.	Price, Portable.	Price of Lever Attachment for altering speed.	Price of Stop Valve.
1	18 00	20 00	17 00
1 1/2	20 00	22 00	19 00	..	5 25
2	24 00	27 00	23 00	2 00	6 50
2 1/2	29 00	32 00	27 00	2 25	8 50
3	34 00	38 00	31 00	2 50	11 50
3 1/2	41 00	46 00	38 00	3 25	16 00
4	47 00	54 00	44 00	3 50	17 00
4 1/2	50 00	57 00	47 00	3 75	19 00
5	55 00	62 00	52 00	4 00	22 00
5 1/2	62 00	70 00	59 00	4 25	24 00
6	71 00	80 00	67 00	4 50	27 00
6 1/2	81 00	92 00	77 00	5 00	32 00
7	91 00	103 00	87 00	5 25	37 00
7 1/2	102 00	114 00	98 00	5 50	42 00
8	116 00	129 00	112 00	6 00	48 00
8 1/2	134 00	148 00	130 00	6 25	55 00
9	160 00	178 00	156 00	6 50	63 00
9 1/2	199 00	219 00	194 00	7 00	72 00
10	230 00	255 00	225 00	7 25	83 00

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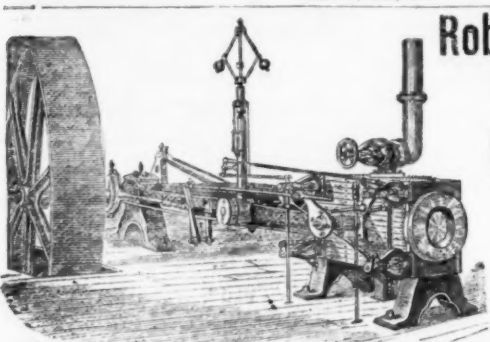
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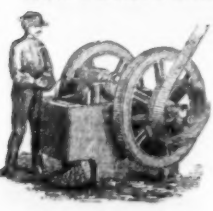
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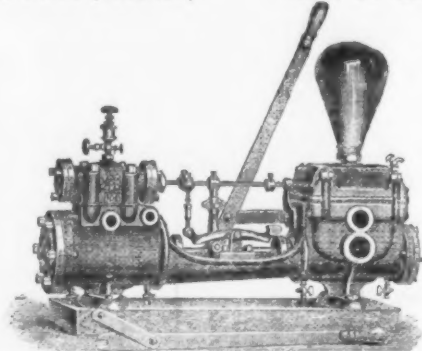
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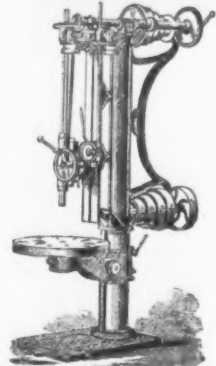
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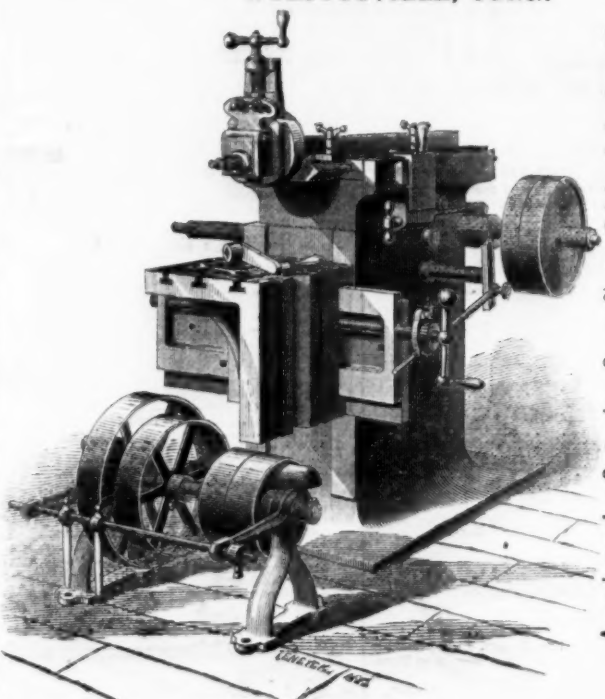
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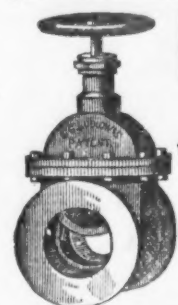
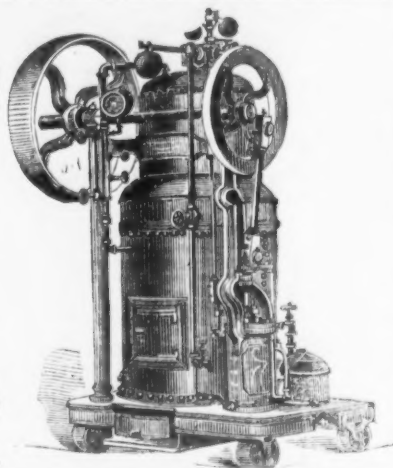
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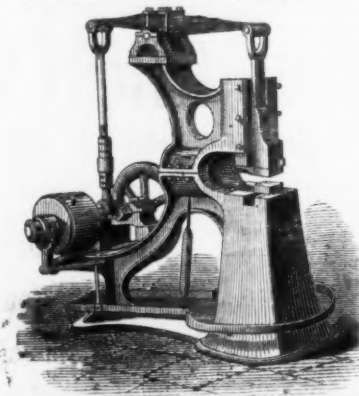
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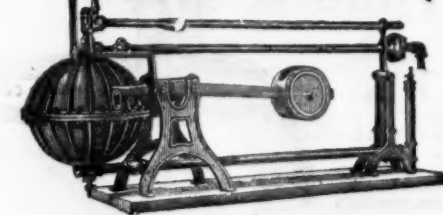
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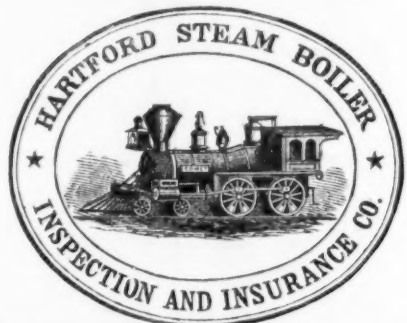
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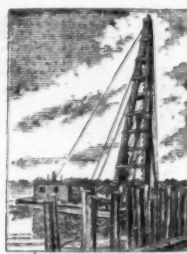
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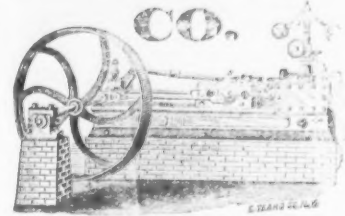
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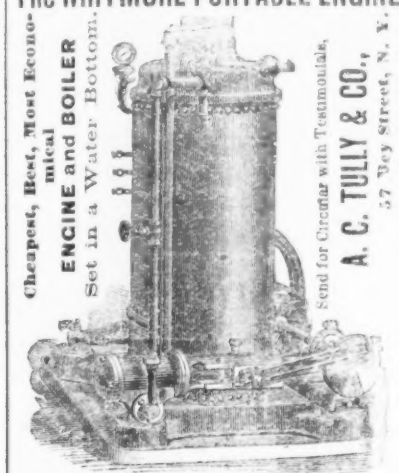
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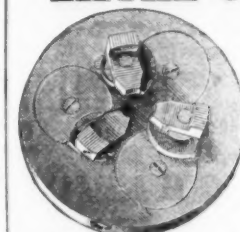
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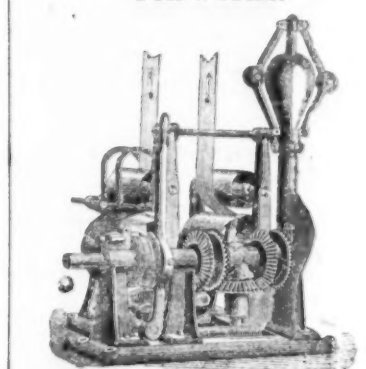
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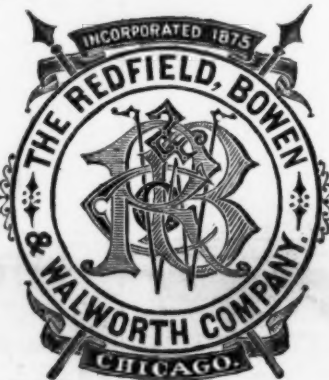
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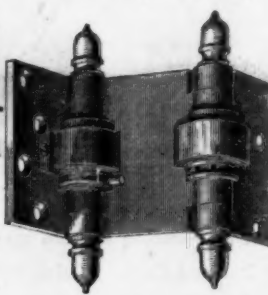
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